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The Law of Above Averages: Leveling the New Genetic Enhancement Playing Field

Maxwell J. Mehlman[1]

I. INTRODUCTION

In March of 1997, Ronald Crystal, a researcher at New York Hospital-Cornell Medical Center, requested permission from the National Institutes of Health ("NIH")[2] to conduct an experiment in which altered genes would

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2. Specifically, permission was requested from the Recombinant DNA Advisory Committee ("RAC"), which had the authority to approve protocols for genetic experiments that were financed by NIH grants. *See* 42 U.S.C. § 282(b)(6) (West 1998) (giving the Director of the National Institutes of Health the authority to establish scientific review groups and advisory committees such as RAC). This authority was transferred to the Food and Drug Administration on October 31, 1997. *See* Notice of Action Under the NIH Guidelines for Research Involving Recombinant DNA Molecules, 59 Fed. Reg. 34,496 (1994), *amended by* 59 Fed. Reg. 40,170 (1997); 60 Fed. Reg. 20,726 (1997); 61 Fed. Reg. 1482 (1997); 61 Fed. Reg. 10,004 (1997); 62

be introduced into human subjects.[3] The proposal was historic. Although the NIH had previously approved numerous experiments in which functioning, modified genes were inserted into patients suffering from fatal illnesses,[4] and despite the fact that the purpose of Crystal's experiment was to foster the treatment of patients suffering from cystic fibrosis, this was the first time that the NIH was asked to permit the injection of modified genes into normal, healthy volunteers.[5] Officials at NIH recognized the significance of this event. Crossing the threshold between patients and healthy individuals introduced the possibility of manipulating the genes of normal people for non-therapeutic reasons.[6] It signaled a major step toward employing gene transfer technology to enhance inherited traits, as opposed to curing, mitigating, or treating disease.

While Crystal's proposal was an historic event, his experiment was not the first instance in which products and techniques that emerged from the

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Fed. Reg. 4782 (1997). For a history of the Recombinant DNA Advisory Committee, see National Institutes of Health, Recombinant DNA Research: Proposed Actions Under the Guidelines, 61 Fed. Reg. 59,726 (1996); Judith Areen, *Regulating Human Gene Therapy*, 88 W. VA. L. REV 153 (1985-86).

3. The researcher, Dr. Ronald G. Crystal, planned to introduce into twenty-one subjects a virus that had been genetically altered to prevent it from replicating, and to produce a non-human enzyme. The objective was to ascertain the response of the subjects' immune systems to the virus. The ultimate goal was to use the virus to deliver genetically altered substances to treat patients suffering from cystic fibrosis. *See* RECOMBINANT DNA ADVISORY COMMITTEE, DISCUSSION REGARDING THE USE OF NORMAL SUBJECTS IN HUMAN GENE TRANSFER CLINICAL TRIALS 2 (March 6-7, 1997) (on file with author) (discussing protocol to characterize local, systemic and distant compartment immunity in normal individuals after intradermal administration of a replication deficient Ad5-based vector carrying gene coding for the *E. coli* enzyme, cytosine adenase).

4. These illnesses are: Fanconi anemia, lung cancer, breast cancer, ovarian cancer, brain cancer, melanoma, leptomeningeal carcinomatosis, colon cancer, renal cancer, neuroblastoma, chronic myelogenous leukemia, prostate cancer, central nervous system cancer, head and neck squamous, astrocytoma, chronic granulomatous, multiple myeloma, gastrointestinal tract cancer, malignant glioma, testicular cancer, partial ornithine transcarbamylase deficiency, bladder cancer, Non-Hodgkin's disease, B-Cell Lymphoma, bone marrow transplants, HIV, cystic fibrosis, glioblastoma multiform, Gaucher Disease, rheumatoid arthritis, Alpha-1-Antitrypsin Deficiency, Hunter Syndrome, peripheral artery disease, Hodgkin's Disease, and Canavan Disease. Office of Recombinant DNA Activities, *Protocol List* (last modified April 7, 1998) <http://www.nih.gov/od/orda/protocol.html>.

5. *See* Rick Weiss, *Gene Therapy Has Skin Crawling*, WASH. POST, Oct. 12, 1997, at A1 (discussing the potential implications of gene therapy on healthy adults).

6. Accordingly, NIH convened its first Gene Therapy Policy Conference on September 11, 1998, entitled "Human Gene Transfer: Beyond Life-Threatening Disease," to consider the scientific, ethical, legal, and social implications of genetic enhancement technologies. *See* Letter from Debra Knorr to Maxwell Mehlman, Acting Director, Office of Recombinant DNA Activities, National Institutes of Health (August 6, 1997) (on file with author) (inviting author to address meeting on regulating genetic enhancement).

revolution in human genetics were deployed to improve normal human traits. The NIH previously approved the use of gene transfer technology to boost the functioning of low density lipoprotein receptors above the normal range in persons suffering from hypercholesterolemia (an inherited inability to clear cholesterol from the blood). According to one expert, the result was to give these patients a "super-cleansing ability."[7] Genetically engineered products are also used by healthy persons to give them a physical advantage in sports. For example, parents with children of normal height sometimes request that pediatric endocrinologists prescribe human growth hormone, which is genetically engineered through recombinant DNA technology, with the hope that their children will grow tall enough to play highly competitive basketball.[8] The use of growth hormone by athletes to increase muscle and bone growth appears, in fact, to be widespread.[9]

Against this background, the Human Genome Project is nearing its completion. This project, which began in the early 1990s at an estimated cost of $3 billion,[10] and which is due to be completed by 2003, is mapping[11]

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7. *See* Eric Juengst, Remarks at the meeting of the NIH Recombinant DNA Advisory Committee, Discussion Regarding the Use of Normal Subjects in Human Gene Transfer Clinical Trials 3 (March 6-7, 1997) (describing protocol submitted by James Wilson, #9110-012). Juengst noted that experiments aimed at using genetically engineered substances to immunize patients against cancer also constitute attempts to enhance people beyond their normal range. *Id.*

8. *See* Rita Rubin, *Giving Growth a Synthetic Hand Use of Hormone Sparks Debate*, DALLAS MORNING NEWS, July 7, 1986, at A1. For a discussion of the use of human growth hormone in healthy children, see American Academy of Pediatrics, *Considerations Related to the Use of Recombinant Human Growth Hormone in Children*, 99 PEDIATRICS 122 (1997); Leona Cuttler et al., *Short Stature and Growth Hormone Therapy: A National Study of Physician Recommendation Patterns*, 276 JAMA 531 (1996); Barry Werth, *How Short Is Too Short?*, N.Y. TIMES, June 16, 1991, § 6, at 14.

9. *See* Daniel A. Smith & Paul J. Perry, *The Efficacy of Erogogenic Agents in Athletic Competition Part II: Other Performance-Enhancing Agents*, 26 ANN. PHARM. 653 (1992) (describing the effects of human growth hormone on muscle mass and bone growth); Michael Bamberger & Don Yaeger, *Over the Edge Aware That Drug Testing Is a Sham, Athlete to Rely More Than Ever on Banned Performance Enhancers*, SPORTS ILLUSTRATED, Apr. 14, 1997, at 60 (referring to the use of human growth hormone by athletes to increase growth of muscle and bones).

10. The Human Genome Project is international in scope. At least 18 countries have established human genome research programs. Some of the larger programs are in Australia, Brazil, Canada, China, Denmark, Europe, France, Germany, Israel, Italy, Japan, Korea, Mexico, Netherlands, Russia, Sweden, United Kingdom, and the United States. U.S. Dep't of Energy Human Genome Program, *Human Genome Project Information* (last modified July 8, 1998) <http://www.ornl.gov/TechResources/Human_Genome/faq/faqs1.html>. Some notable international collaborations are: United States-United Kingdom on sequencing the *Caenorhabditis elegans* genome; Los Alamos National Laboratory-Australia on developing a physical map of chromosome 16; Lawrence Livermore National Laboratory-Japanese scientists on developing a physical map of chromosome 21. The NIH is working with the *Centre d'Etudo du Polymorphisme Humain* (CEPH) on the genetic map of the human genome and the White-

and sequencing[12] the three billion nucleotide base pairs that comprise the entire human genetic code.[13] The scope of the project extends well beyond discerning the structure of human genetic material. Researchers are attempting to correlate genes with specific human disorders. This knowledge will enable physicians to test individuals for inherited conditions.[14] Moreo-

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head/Massachusetts Institute of Technology is working with Genethon on the whole-genome approach to the human physical map. However, the bulk of the research is being conducted in the United States and is being funded by the Department of Energy Human Genome Program and the National Institutes of Health Human Genome Research Institute. *See* Francis Collins & David Galas, *A New Five-Year Plan for the U.S. Human Genome Project*, 262 SCI. 43 (1993).

11. "Mapping" refers to locating genes on particular chromosomes. A complete genetic map of the human genome was completed in 1994. *See* Jeffrey C. Murray et al., *A Comprehensive Human Linkage Map with Centimorgan Density*, 265 SCI. 2049 (1994).

12. "Sequencing" refers to identifying the order of the four molecules, called nucleotides (adenine, thymine, guanine, and cytosine), that carry genetic information. The order of these molecules determines what proteins they "code for" (through the production of RNA and the translation of RNA into sequences of amino acids); the proteins in turn control and provide the raw material for all chemical reactions in the body. Although there are 3 billion pairs of these nucleotides, most of them appear to be nonfunctional, and are known as "junk DNA." *See* Katheleen Gardiner, *Clonability and Gene Distribution on Human Chromosome 21: Reflections of Junk DNA Content?*, 205 GENE 39 (1997) (raising the possibility that more than 90% of the DNA in the largest gene on Chromosome 21 may be functionless); Nicholas Wade, *The Struggle to Decipher Human Genes*, N.Y. TIMES, Mar. 10, 1998, at F1 (stating that "97 percent of human DNA consists of a variety of identical sequences repeated over and over"); *see also* William A. Haseltine, Editorial, *Gene-Mapping, Without Tax Money*, N.Y. TIMES, May 21, 1998, at A33 (stating that "less than 5 percent of our DNA contains real information"). There has been some evidence, however, that these so-called "junk" sequences may play a functional role in the genome. *See* Emile Zuckerkandl, *Revisiting Junk DNA*, 34 J. MOL. EVOL. 259 (explaining that the sea of nonfunctional DNA is to a "significant extent permeated by function"); *see also* Laura Manuelidis, *A View of Interphase Chromosomes*, 250 SCI. 1533 (1990) (discussing the possible role of "junk" DNA in chromosome folding).

13. The original projection was that it would cost $3 billion to map and sequence 3 billion base pairs, or $1.00 per pair. The goal of reducing the cost to $.50 per base pair was targeted for 1996. Collins & Galas, *supra* note 10, at 43. Now at the best facilities the cost is between $0.30 and $0.50 per base pair, and there are estimates that this will be further decreased to $0.10 per base pair. E-mail from Marissa Mills, Technical Assistant, *Human Genome Management Information Systems*, to Maxwell Mehlman (May 21, 1997) (on file with author).

14. Commercial tests are currently available for approximately 550 genetic disorders. E-mail from Debra Collins, Genetic Counselor, *University of Kansas Medical School*, to Maxwell Mehlman (June 12, 1998) (on file with author). Some of these tests identify a genetic condition that is responsible for a person's current symptoms, such as cystic fibrosis; others identify a genetic condition such as Huntington's disease that may not be producing symptoms currently but instead may only produce symptoms in the future; still others indicate only that a person has a genetic susceptibility to a certain future condition, such as breast cancer, and may indicate the genetic probability that the person in the future will suffer from the condition. *See* Bruce Ponder, *Genetic Testing for Cancer Risk*, 278 SCI. 1050 (1997) (explaining the opportunity for genetic testing to family members); *see also* Tom Caskey et al., *The American Society of Human Genetics Statement on Cystic Fibrosis Screening*, 46 AM. J. HUM. GENET. 393 (1990) (propos-

ver, the combination of information generated by the Human Genome Project with genetic engineering techniques already under development will enable physicians to devise gene therapies for these individuals. Gene therapy will thus allow doctors to delete defective or disease-producing genes from patients' DNA, or to insert therapeutic genes.

Genes are responsible for more than just diseases, however. In conjunction with environmental influences,[15] they engender physical appearance, personality traits, and mental faculties such as cognition[16] and intelligence.[17] The same genetic testing and engineering techniques that are be-

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ing guidelines for cystic fibrosis testing); Michael R. Hayden et al., *Improved Predictive Testing for Huntington Disease by Using Three Linked DNA Markers*, 43 AM. J. HUM. GENET. 689 (1988) (explaining how the use of three markers increases the reliability in the estimation of genetic risk); Neil A. Holtzman et al., *Predictive Genetic Testing: From Basic Research to Clinical Practice*, 278 SCI. 602 (1997) (explaining regulations for offering commercial genetic tests). Testing for conditions that will not manifest symptoms until some point in the future leads to concerns that the tested individuals will face discrimination if the test results become known to employers or insurers. *See generally* LORI ANDREWS & JANE E. FULLARTON, ASSESSING GENETIC RISKS: IMPLICATIONS FOR HEALTH AND SOCIAL POLICY (Neil A. Hotzman & Arno G. Motulsky eds., 1994) (describing ethical, legal, and policy issues raised by genetic testing).

15. The precise interaction of genetic and environmental factors—the so-called "nature versus nurture" question—is as yet poorly understood. Francis Galton, Charles Darwin's cousin, coined the phrase "nature-nurture." His view was that nature prevailed enormously over nurture, that genetics determine who we are and how we behave. Galton thought environment played a minor role in behavioral development. People in this school of thought became known as "hereditarians." "Environmentalists," on the other hand, argued that there was "no such thing as an inheritance of capacity, talent, temperament, mental constitution and characteristics" and that the environment determined our behavior. *See* J.B. WATSON, BEHAVIORISM 74 (1925). Today there is probably not a single scientist who would assert that behavior is ruled completely by the environment or completely by genetics. Research in the field of behavioral genetics has shown that "genetic influence is significant and substantial for most areas of behavioral development, even though it is not true that 'nature prevails enormously over nurture.'" ROBERT PLOMIN, GENETICS AND EXPERIENCE 3 (1994); *see* Susan M. Wolf, *Beyond Genetic "Discrimination": Toward the Broader Harm of Geneticisim*, 23 J.L. MED. & ETHICS 345 (1995) (pointing out that those who assert the importance of genetic factors are criticized by others for their "genetic determinism" or "geneticism").

16. Studies comparing twins who were separated at birth and raised in different families reveal that non-disease traits such as personality and cognition are genetically influenced. *See* Thomas J. Bouchard, Jr., *Genes, Environment, and Personality*, 264 SCI. 1700 (1994) (stating that "two-thirds of the reliable variance in measured personality traits is due to genetic influence"); *see also* Deborah Finkel et al., *Heritability of Cognitive Abilities in Adult Twins: Comparison of Minnesota and Swedish Data*, 25 BEHAV. GENET. 421, 430 (1995) (estimating that cognition in early and middle adulthood has a heritability factor of approximately 81%); Stephen A. Petrill et al., *The Genetic and Environmental Variance Underlying Elementary Cognitive Tasks*, 25 BEHAV. GENET. 199 (1995) (demonstrating that elementary cognitive tasks display genetic effects).

17. *See* Richard Lynn & Ken Hattori, *The Heritability of Intelligence in Japan*, 20 BEHAV. GENET. 545 (1990) (finding that intelligence has a heritability of .582); Laura A. Baker et al., *The Genetic Correlation Between Intelligence and Speed of Information Processing*, 21 BEHAV. GENET. 351 (1991) (explaining that common biological mechanisms underlie "performance in both

ing developed to respond to genetic illness eventually may be employed to identify and alter a person's non-disease traits. The Crystal protocol and the NIH's recognition of the need to explore its policy implications suggest that this day may not be far off.

In this article, I will explore some of the legal implications of this emerging technology—the technology of genetic enhancement.[18] Specifically, I will discuss how the law might respond to two related consequences: an increase in social inequality, and the unfairness that may result when genetically enhanced individuals compete with un-enhanced persons for scarce resources.

In order to comprehend how these societal concerns might arise, it is necessary to understand what is meant by genetic enhancement, to consider the many forms of genetic enhancements, and to predict the methods that individuals are likely to employ to acquire them. First, what is "genetic" enhancement? People employ various means in an attempt to improve themselves and their children. Their efforts may affect and may be affected—at least in part—by their genetic inheritance. For example, someone who is attractive by virtue of their genetic good fortune may find it easier to marry an attractive mate and produce attractive children. But for purposes of this paper, an enhancement is deemed "genetic" only when it is the product of biotechnological processes. These include DNA recombination to make pharmacological products, and direct manipulation of genes, such as gene insertion or deletion. These new biotechnological capabilities are creating a revolution in human genetics, which in turn is producing the social and legal challenges that are the subject of this paper.

If the foregoing paragraph describes what is meant by "genetic" in the context of enhancement, what, then, is the meaning of "enhancement"? Not all genetic interventions are enhancements. Many, and for the time

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intelligence tests and speed of information processing").

18. Although there is an enormous and growing body of literature on the ethical, legal, and social implications of the Human Genome Project, much less exists on the topic of genetic enhancement, perhaps because it is thought to be more speculative or farther in the future. *See, e.g.*, LEROY WALTERS & JULIE G. PALMER, *Enhancement Genetic Engineering*, *in* THE ETHICS OF HUMAN GENE THERAPY 99 (1997); George J. Annas, *Mapping the Human Genome and the Meaning of Monster Mythology*, 39 EMORY L.J. 629 (1990); Alexander M. Capron, *Which Ills to Bear? Reevaluating the "Threat" of Modern Genetics*, 39 EMORY L.J. 665 (1990); William Gardner, *Can Genetic Enhancement Be Prohibited?*, 20 J. MED. & PHIL. 65 (1995); Eric Parens, *The Goodness of Fragility: On the Prospect of Genetic Technologies Aimed at the Enhancement of Human Capabilities*, 5 KENNEDY INST. ETHICS J. 141 (1995); John Robertson, *Genetic Selection of Offspring Characteristics*, 76 B.U. L. REV. 421 (1996); E. J. Rosenkranz, *Custom Kids and the Moral Duty to Genetically Engineer Our Children*, 2 HIGH TECH. L.J. 3 (1987). For a provocative work on the related issue of performance enhancement, see Michael H. Shapiro, *The Technology of Perfection: Performance Enhancement and the Control of Attributes*, 65 S. CAL. L. REV. 11 (1991).

being, almost all, are aimed at treating or preventing disease. A genetic intervention is an "enhancement," however, (1) when it is undertaken for the purpose of improving a characteristic or capability that, but for the enhancement, would lie within what is generally accepted as a "normal" range for humans; or (2) when it installs a characteristic or capability that is not normally present in humans.[19]

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19. For a general discussion of the distinction between enhancement and therapy, see Norman Daniels, *Growth Hormone Therapy for Short Stature: Can We Support the Treatment/Enhancement Distinction?*, 8 GROWTH, GENET., & HORMONES 46 (1992); Eric T. Juengst, *Can Enhancement Be Distinguished from Prevention in Genetic Medicine?*, 22 J. MED. & PHIL. 125 (1997); Eric T. Juengst, *What Does Enhancement Mean?*, *in* ENHANCING HUMAN CAPACITIES: CONCEPTUAL COMPLEXITIES AND ETHICAL IMPLICATIONS (Eric Parens ed., 1998); Parens, *supra* note 18, at 141.

The concept of enhancement invariably leads to consideration of what is meant by "normal." Typically, the term refers to a certain distribution of a population around an average measure for a trait, a distribution which has come to be accepted as the norm. For example, people are generally considered to be "abnormally short" or "abnormally tall" if their height is more than two standard deviations from the mean height of the population. Cuttler et al., *supra* note 8, at 532. Approximately 90,000 of the three million children born each year will fall into this category. *See* Werth, *supra* note 8, at 14; *cf.* E. Kirk Neely & Ron G. Rosenfeld, *Use and Abuse of Human Growth Hormone*, 45 ANN. REV. MED. 407 (1994) (revealing that most endocrinologists require a height that is at least three standard deviations below mean height before they will administer growth hormone therapy). Since two standard deviations comprises, by definition, 95.4% of the population, this practice automatically identifies 4.% of the population as either "too short" or "too tall." But there is no inherent reason why two standard deviations is considered "normal," rather than one, or three, which would lead to "abnormal" percentages of 31.7% and 0.3% of the population respectively.

A more sophisticated definition of "normalcy" is that it is a level of functionality that allows an individual to enjoy the opportunity range typical of their species. However, this approach, championed by Norman Daniels, falters when it attempts to delineate the boundary between therapy and enhancement. *See* Daniels, *supra*, at 46 (segmenting gene therapy from gene enhancement). As Eric Juengst observes, Daniels' thesis assumes that we can define "species-typical function" and that an individual's "skills and talents" are fixed according to the "natural lottery" of human genetics, neither of which obtains once genetic enhancements become available. *See* Juengst, *supra*; *see also* C. John Dupre, *Normal People*, 65 SOC. RES. 221 (1998) (claiming that there is no such thing as normal behavior). It is beyond the scope of this paper to attempt to resolve the problem of defining "normal." It is sufficient that the reader understands both that the concept refers to some degree of prevalence of a trait in society, and that the concept is changeable, value-laden, arbitrary, and subjective. For these reasons, I will use it in quotes.

A discussion of genetic enhancement does tend to avoid the objectionable practice of equating "normal" with "good" or "desirable" or "worthwhile," a practice that understandably infuriates people who are not "normal" in regard to characteristics such as height, weight, and so on. The concept of enhancement stigmatizes everyone who is unenhanced—both people who are "normal" as well as those who are not or who are "below normal" (although those who are "below normal" may be regarded as worse off). For a discussion of the relative positions of those who are enhanced, those who are "normal" but not enhanced (the "un-advantaged"), and those who are neither "normal," nor enhanced (the disadvantaged), see *infra* notes 114-

Genetic enhancement can occur in a number of ways. It can take the form of somatic enhancements in adults and children, pre-conception enhancement, selective abortion, embryo selection, and germ-line enhancement. Each of these will be described in turn.

Genetic enhancement may produce a *somatic enhancement effect in an adult*. A somatic effect is one that affects the non-reproductive portions of the anatomy, and therefore cannot be inherited by one's children. A classic example of a non-genetic somatic enhancement in adults is the use of drugs to improve athletic and cognitive performance. People occasionally use caffeine and nicotine to improve their concentration,[20] and athletes long have been reported to use performance-enhancing drugs, particularly anabolic steroids, to increase muscle mass.[21] Advances in human genetics will open the door to a new range of somatic enhancements manufactured with genetic technology. Athletes already use genetically-engineered products, like erythropoietin manufactured by recombinant DNA technology, to enhance endurance.[22]

Another type of genetic enhancement is *somatic enhancement in children*.[23] This type of somatic enhancement is exemplified by the reported

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123 and accompanying text.

20. *See* Peter J. Whitehouse et al., *Enhancing Cognition in the Intellectually Intact*, 27 HASTINGS CTR. REP. 14 (May-June 1997) (discussing advances in the development of drugs that enhance cognition in "normal" individuals, albeit not yet involving DNA recombination or genetic engineering).

21. *See* Thomas H. Murray, *Drugs, Sports and Ethics*, *in* FEELING GOOD AND DOING BETTER: ETHICS AND NONTHERAPEUTIC DRUG USE 107 (Thomas H. Murray et al., eds., 1984) (describing use of steroids by athletes). The practice is not limited to adults. *See* Dan Barry, *The Hidden Aspects of Showy Muscles: Despite the Dangers of Steroids, Bodybuilders Are Still Tempted*, N.Y. TIMES, Dec. 21, 1996, § 1, at 27 (stating that officials estimate that between five and twelve percent of teen-age boys have used steroids by the time they graduate from high school); *College Study: Girls' Steroid Use Up*, N.Y. TIMES, Dec. 15, 1997, at 8 (stating that as many as 175,000 high school girls have used steroids).

22. Erythropoietin, administered by injection, enables the blood to carry more oxygen, thereby improving stamina. *See* Lawrence M. Fisher, *Stamina-Building Drug Linked to Athletes' Deaths*, N.Y. TIMES, May 19, 1991, § 1, at 22 (discussing how this genetically engineered drug increases stamina).

23. Administering genetic enhancements to children at the request of their parents raises concerns that go beyond the scope of this article, in particular, concerns about the rights of parents to control the lives of their children. When would it be appropriate, for example, for parents to provide an enhancement to their children when the enhancement carried with it a health risk? These same concerns are raised by germ line genetic enhancements that are passed on to one's children. *See* THOMAS H. MURRAY, THE WORTH OF A CHILD 115-41 (1996) (discussing the ethics of manipulating genes to achieve a "perfect" child); Dena S. Davis, *Genetic Dilemmas and the Child's Right to an Open Future*, 28 RUTGERS L.J. 549, 575 (1997) (noting that "[a] decision made before a child is born that confines her forever to a narrow group of people and a limited choice of careers, so violates the child's right to an open future that no genetic counselor should acquiesce to it"); Robertson, *supra* note 18, at 479 (arguing that "[a]

use of genetically-engineered human growth factor in children of "normal" height. Again, because the effect is somatic, it is not genetically transferred to successive generations.[24]

Genetic enhancement also is made possible by the development of tests to identify genetic characteristics, including non-disease traits that have genetic components. These tests create the possibility of several types of enhancement approaches related to reproductive decision-making. The first of these is *pre-conception enhancement*, in which decisions about whether or not, and with whom, to conceive a child are made on the basis of pre-conception genetic testing. Just as some people now test themselves to avoid conceiving a child with another person who is a "carrier" for a recessive genetic disorder,[25] prospective mates could test themselves to determine if they are likely to produce offspring who would be desirable in terms of non-disease characteristics. Unsatisfactory test results may cause couples to refrain from marrying or conceiving, at least not without employing genetic manipulations to improve the genetic profile of the offspring. If the couple refrains from genetic manipulations, this is a passive version of enhancement. This technique would not produce a "better" child, but only enable prospective parents to avoid giving birth to a child whose genetic characteristics they deemed to be undesirable. Nevertheless, it qualifies as a genetic enhancement because one may assume that the child's characteristics would be "better" than if reproduction took place without pre-conception testing of the potential parents.

Enhancement via selective abortion is another passive form of genetic enhancement stemming from genetic testing. With this approach, fetuses are tested *in utero* and those that do not meet the parents' expectations are aborted.[26] An alternative to selective abortion would be *embryo selection for*

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consistent commitment to procreative liberty necessarily leaves parents wide prebirth discretion to select—or not—the characteristics of their offspring").

24. A form of somatic enhancement of a child also could occur if the parents had the child genetically tested for non-disease traits and then intervened in various ways to enhance the child's genetic characteristics. For example, assuming that musical ability is related at least in part to a person's genes, *see* Sandra Blakeslee, *Perfect Pitch: The Key May Lie in the Genes*, N.Y. TIMES, Nov. 20, 1990, at C1, the parents of a child whose genetic testing showed it to be musically gifted could provide the child with music lessons to enhance its innate talent.

25. A successful example is screening programs for Tay-Sachs disease carried out under the auspices of local Jewish community groups. *See* Paul J. Edelson, *The Tay-Sachs Disease Screening Program in the U.S. as a Model for the Control of Genetic Disease: An Historical View*," 7 HEALTH MATRIX 125, 126 (1997).

26. *See* ROBERT BLANK & JOANNE C. MERRICK, HUMAN REPRODUCTION, EMERGING TECHNOLOGIES, AND CONFLICTING RIGHTS 134, 135 (1995) (discussing the increasingly common use of amniocentesis, chorion villus sampling, and other techniques to detect genetic disorders with the possibility of abortion as a consequence of an unfavorable result); *see also* NEW YORK STATE TASK FORCE ON LIFE AND THE LAW, ASSISTED REPRODUCTIVE TECHNOLOGIES

enhancement. This technique combines genetic testing with *in vitro* fertilization. Embryos are tested before insertion in the womb, and only embryos with advantageous characteristics are implanted.[27]

Finally, and most dramatically, an early-stage embryo might be genetically altered prior to implantation, with DNA inserted or deleted to produce desired traits in the child. If performed at an early-enough stage of embryonic development,[28] the alteration affects all subsequent fetal cells,

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165 (1998) (hereinafter NEW YORK STATE TASK FORCE REPORT) (discussing pre-implementation genetic diagnosis and sex selection). A particularly controversial form of genetic selection is the abortion of a fetus because of its gender. *See* Dorothy C. Wertz & John C. Fletcher, *Fatal Knowledge? Prenatal Diagnosis and Sex Selection*, 19 HASTINGS CTR. REP. 21 (1989) (discussing the common use of prenatal diagnosis for sex screening); Lynne Marie Kohm, *Sex Selection Abortion and the Boomerang Effect of a Woman's Right to Choose: A Paradox of the Skeptics*, 4 WM. & MARY L. REV. 91, 92 (1997) (discussing how sex selection results in an unbalanced sex ratio). For an expansive view of genetic selection of offspring, see Robertson, *supra* note 18, at 479 (arguing that "commitment to procreative liberty necessarily leaves parents wide prebirth discretion to select—or not—the characteristics of their offspring"). Fetal genetic testing currently requires a sample of fetal DNA, which currently must be obtained from the fetal organism or from amniotic fluid. On the horizon is a technique in which fetal DNA is obtained from fetal cells circulating within the maternal blood supply. This will significantly simplify fetal genetic testing. *See* Y.M. Dennis Lo et al., *Presence of Fetal DNA in Maternal Plasma and Serum*, 350 LANCET 485 (1997) (explaining how the finding of "fetal DNA in maternal plasma may have implications for non-invasive prenatal diagnosis").

27. In vitro fertilization ("IVF") refers to the union of sperm and egg, or oocyte, in a laboratory dish. It involves stimulating the ovaries to produce several mature oocytes in a single cycle, collecting these oocytes before they are released from the ovaries, and fertilizing them with sperm in a nutrient-rich culture medium. Fertilized oocytes are then transferred into the uterus. Another pre-implantation fertilization technique, zygote intrafallopian transfer, involves the same procedure but the embryos are transferred into the fallopian tubes instead of the uterus. The rationale behind this procedure is to increase the chance of the embryos implanting into the uterus. *See generally* NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 51-63 (discussing zygote intrafallopian transfer). IVF now makes it possible to screen embryos for inherited diseases before pre-implantation. *See* Alan H. Handyside & Joy D. A. Delhanty, *Preimplantation Genetic Diagnosis: Strategies and Surprises*, 13 TRENDS IN GENETICS 270 (1997) (explaining that preimplantation genetic diagnosis avoids the possibility of having to decide whether or not to terminate an established pregnancy diagnosed as affected); *e.g.*, Asangla Ao, *Preimplantation Genetic Diagnosis of Inherited Disease*, 34 INDIAN J. OF EXPERIMENTAL BIOLOGY 1177 (1996) (showing that preimplantation diagnosis was successfully achieved for cystic fibrosis, Tay-Sachs, and Duchenne muscular dystrophy).

28. The best time to genetically alter an embryo would be at the first cell stage so that all cells would be affected. *See Regulatory Issues: Department of Health and Human Services National Institutes of Health Recombinant DNA Advisory Committee Minutes of Meeting*, 8 HUM. GENE THERAPY 1137, 1160 (1997). It is believed, however, that genetic alteration could be performed at later stages. Preimplantation diagnosis involves the analysis of a blastomere from a two day-old embryo containing four cells or the cells of a five day-old blastocyst after IVF. Removal of these cells "does not appear to alter the embryo's developmental possibilities." Jacques Testart, *The New Eugenics and Medicalized Reproduction*, 4 CAMBRIDGE Q. OF HEALTHCARE ETHICS 304, 307 (1995). It is doubtful that genetic manipulation would succeed

including germ cells—that is, those that become eggs or sperm. This process yields *germ-cell enhancement*, in which genetic changes are passed on to successive generations when the enhanced individual reproduces.[29]

It is currently impossible to be certain when these genetic enhancements will become available and how successful they will be.[30] Moreover, there are good reasons for doubting that extensive and successful genetic enhancements are achievable. For example, it may be that somatic enhancements are accompanied by serious adverse side effects.[31] While manipulating embryos genetically may prevent further embryonic development, it is also possible that it may create non-viable or severely impaired organisms.[32] Altering genes that interact with other genes may have unfore-

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more at a later stage than preimplantation diagnosis, since beyond that point, the cells of the embryo are no longer "totipotent" but would begin to differentiate, and it would be difficult to ensure that the genetic alteration affected the correct organs or tissues. Embryo-splitting (which results in twinning) involves isolating individual cells of very early embryos at the blastomere stage and growing them into separate embryos. This must be done at the blastomere stage when the cells are still totipotent and carry their full genetic complement for development. *See* Nat'l Advisory Bd. on Ethics in Reproduction, *Report on Human Cloning through Embryo Splitting: An Amber Light*, 4 KENNEDY INST. OF ETHICS J. 251 (1994).

29. Note that genetic selection for enhancement also would have genetic effects on subsequent generations, since it would block the transmission of those genes that would have been possessed by the individuals whose birth was prevented.

30. A recent study, for example, failed to find that injections of human growth hormone increased the height of hormone-deficient children of short stature. This casts doubt on its utility in children of "normal" stature as well. *See* Susan Gilbert, *Growth Hormone Use in Children Found Ineffective in Large Study*, N.Y. TIMES, Sept. 23, 1997, at B15.

31. Adverse effects are attributed to the use of similar products that are currently available. These include the risks of toxicity, cancer, and generalized infections from gene therapy; abnormal liver function, tumors, testicular atrophy, masculinization in women, acne, and aggressive behavior from the use of steroids; acromegaly (resulting in increased size of facial bone, thickening of hands and fingers), impotence, diabetes from human growth hormone; and increased blood viscosity from erythropoetin which can lead to hypertension, stroke, congestive heart failure, headache, and clot formation. *See* Nick A. Ghaphery, *Performance-Enhancing Drugs*, 26 SPORTS MED. 433, 437 (1995) (explaining that most of the adverse side effects associated with growth hormone are irreversible); Rebecca Kolberg, *Gene-Transfer Virus Contaminant Linked to Monkeys' Cancer*, 4 J. NIH RES. 43 (1992) (explaining the discovery of cancer in primates after gene therapy); David R. Lamb, *Anabolic Steroids in Athletics: How Well Do They Work and How Dangerous Are They?*, 12 AM. J. SPORTS MED. 31, 35-36 (1984) (describing the potentially harmful side effects of anabolic steroids); Nelson A. Wivel, *Regulatory Considerations for Gene-Therapy Strategies and Products*, 11 TRENDS IN BIOTECHNOLOGY 189 (1992) (stating that "certain types of vectors used to deliver genes pose a small risk of causing cancer" or contamination by micro-organisms); *see also* Smith & Perry, *supra* note 9, at 654 (discussing the adverse effects of human growth hormone and erythropoetin).

32. Attempts to clone frogs by genetically manipulating the nuclei of fully differentiated cells have resulted in abnormal frog embryos. *See* John Gurdon, *The Developmental Capacity of Nuclei Taken from Intestinal Epithelium Cells of Feeding Tadpoles*, 10 J. EMBRYOLOGY & EXPERIMENTAL MORPHOLOGY 622 (1962).

seen dangers; enhancing one trait may cause the degradation of another.[33] Finally, the effects of genetic interventions may be negated or transmuted by environmental factors.[34]

Yet uncertainty works both ways. While the availability of some of these technologies is unlikely for several years, particularly those involving the successful genetic manipulation of embryos, there are no obvious insurmountable scientific barriers to genetic enhancement.[35] Methods of genetic enhancement may not confer the benefits that recipients anticipate; but then again, there is a good chance that they might. What if they do? What if the new genetic technologies can significantly improve inherited traits? What might those traits be? They might comprise physical traits like beauty,[36] stature,[37] strength,[38] and stamina;[39] personality characteristics such

33. In a policy statement on the appropriateness of genetic enhancement, the Council on Ethical and Judicial Affairs of the American Medical Association noted this concern when it recommended that "genetic interventions to enhance traits should be considered permissible in severely restricted situations [when there is] no trade-off with other characteristics or traits . . . ." AMA Council on Ethical and Judicial Affairs, *Ethical Issues Related to Prenatal Genetic Testing*, 3 ARCHIVES FAM. MED. 633, 640 (1994). The AMA council does not explain why someone should be prevented from deciding to enhance one trait at the expense of another—for example, gaining a foot in height at the expense of putting on twenty extra pounds—so long as the individual to be enhanced, and perhaps the health care professionals who are involved in providing the enhancement service, agree that the benefit outweighs the harm.

34. See the discussion of the nature versus nurture controversy at *supra*, note 15.

35. Theodore Friedman, Remarks at the Gene Therapy Policy Conference, National Institutes of Health (Sept. 11, 1997) (transcript on file with author) (discussing scientific prospects for genetic enhancement). Much of the scientific skepticism about the prospects for genetic enhancement may have been dulled by the birth of Dolly, representing the first successful example of mammalian cloning via adult somatic cell nuclear transfer. *See* Gina Kolata, *Little-Known Panel Challenged to Make Quick Cloning Study*, N.Y. TIMES, Mar. 18, 1997, at C1 ("Dr. Wilmut's feat shocked the world, for even most scientists had assumed that the cloning of adults was biologically impossible and was merely the stuff of science fiction.").

36. According to the Center for Medical Genetics at Johns Hopkins University, there are 398 gene-specific traits and diseases that influence appearance. If gene therapy can be done to correct any one of these diseases and thereby improve appearance, then the possibility of enhancing appearance exists. *See* Online Mendelian Inheritance in Man, OMIM (TM). Center for Medical Genetics, Johns Hopkins University (Baltimore, MD) and National Center for Biotechnology Information, National Library of Medicine (Bethesda, MD) (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmim>. Linda Evangelista, for example, is quoted as saying that she and fellow super-models are "genetic freaks." *Model Says Super Looks Just a Freak of Nature*, PLAIN DEALER, May 16, 1996, at 2A.

37. There are 475 gene-specific traits and diseases that affect stature (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>.

38. There are 51 gene-specific traits and diseases that affect strength (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>.

39. OMIM lists one gene-specific disease that affects stamina (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>. Specifically, researchers found a gene that is correlated with physical endurance. *Science Briefs*, PLAIN DEALER, June 21, 1998, at

as charm, cheerfulness, charisma, confidence, and energy;[40] or mental capabilities, including memory,[41] intelligence,[42] and creativity.[43] Ultimately, the aging process too might become subject to genetic manipulation.[44]

These kinds of improvement will be in great demand.[45] But how widely

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8J. Manipulation of this gene might enhance physical endurance beyond the capacity of performance-enhancing drugs in sports.

40. OMIM lists 443 gene-specific traits and diseases that affect personality characteristics (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>; *cf. Genetic Defect May Make Some Men Aggressive*, PLAIN DEALER, Oct. 22, 1993, at 10-A (suggesting that aggressiveness, or its lack, could be genetically enhanced).

41. OMIM lists 47 gene-specific traits and diseases that affect memory (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>. Specifically, Columbia University neuroscientist Eric Kandel has identified a pair of genes, CREB1 and CREB2, which would help regulate the memory process. Memory might be enhanced by partially disabling CREB2. This might help people retain information more easily. *See* Geoffrey Cowley & Anne Underwood, *Forgetfulness Is America's Latest Health Obsession*, NEWSWEEK, June 15, 1998, at 49.

42. OMIM lists 205 gene-specific traits and diseases that affect intelligence (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>. Studies of twins reveal that heritability increases over a lifetime for general cognitive ability. *See* Gerald E. McClearn et al., *Substantial Genetic Influence on Cognitive Abilities in Twins 80 or More Years Old*, 276 SCI. 1560 (1997).

43. Four gene-specific traits and diseases have been found that affect musical ability (visited Sept. 12, 1997) <http://www.ncbi.nlm.nih.gov/htbin-post/Omim/getmin>. The manipulation of these genes could potentially enhance one's musical ability or creativity.

44. Telomeric DNA, located at the ends of chromosomes, consists of repeated sequences that protect the information-containing part of the chromosome. As cells divide, the chromosomes lose telomeric DNA and eventually start to lose sequences containing important information. This results in cell death. If telomerase, an enzyme that adds telomeric DNA, is activated in normal somatic cells, these cells could become immortal. *See* Alexey M. Olovnikov, *Telomeres, Telomerase, and Aging: Origin of the Theory*, 31 EXPERIMENTAL GERONTOLOGY 443 (1996); N.E.A. Crompton, *Telomeres, Senescence, and Cellular Radiation Response*, 53 CELL. & MOL. LIFE SCI. 568 (1997).

45. Although many people will find the prospect of enhancing their genetic traits or those of their children extremely desirable, some, of course, may not. They may feel that enhancing one's children robs them of their autonomy, or turns them into objects, a hazard known as commodification. *See, e.g.*, Vicki G. Norton, *Unnatural Selection: Nontherapeutic Preimplantation Genetic Screening and Proposed Regulation*, 41 UCLA L. REV. 1581, 1606-10 (1984):

> If access to [preimplantation genetic screening] were unrestricted, parents could choose traits in their children, much as animal breeders have 'unconsciously' selected traits in animals for humankind's use . . . . Although parents have children for many reasons, there is a fine line between wanting a child to be the 'best he can be' and wanting to bear a talented child whose talents can be financially exploited.

Id. They may also object on religious grounds—whether from a specific doctrinal perspective or from a fundamental unwillingness to "play God." *See infra* note 81 (discussing religious objections to genetic engineering). They may hesitate for fear that genetic enhancement will promote unfairness or inequality, as discussed below. They may claim that genetic enhancement is simply too hubristic. *See, e.g.*, W. FRENCH ANDERSON, HUMAN GENE THERAPY: WHERE TO DRAW THE LINE 6-7 (1986), *reprinted in* LAW, SCIENCE, AND MEDICINE 27 (J. Areen et al.

available will the technologies be that make them possible? The answer depends both on how many institutions and professionals are willing and able to provide enhancement services, and on the cost of such enhancements. While some genetically engineered drugs that produce somatic enhancements may be relatively affordable, others may not. Growth hormone therapy for a 20 kilogram child, for example, costs $14,000 per year.[46] This is, conceivably, a manageable sum for a number of parents. In addition, some types of genetic enhancements may not add much to the cost of therapeutic or preventive measures. For example, it may not cost a great deal more to include a number of tests for non-disease traits in a battery of genetic tests performed on fetuses *in utero* designed for the purpose of detecting abnormalities or disease.[47] This might make genetic selection for enhancement, in which *in utero* testing is combined with abortion, the enhancement technique of choice for the less well-off.[48] Other enhancement approaches, on the other hand, will be quite expensive. Enhancements performed on embryos, including germ cell enhancement, would be costly since they necessarily impose the cost of *in vitro* fertilization, which cur-

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eds., 1st ed. Supp. 1987) (comparing a person altering a characteristic to a "young boy who loves to take things apart" taking apart a watch, adding that "[a]ttempts on his part to improve the watch will probably only harm it").

46. *See* Beth S. Finkelstein et al., *Insurance Coverage, Physician Recommendations, and Access to Emerging Treatments: Growth Hormone Therapy for Childhood Short Stature*, 279 JAMA 663 (1998). Originally, human growth hormone was extracted from cadaveric pituitary glands and the NIH made it available free of charge. In early 1985, however, a process was developed to manufacture the hormone using recombinant DNA processes. Although the supply was now almost inexhaustible, the companies making the substance (Genentech and Eli Lilly & Co.) began charging high prices—an estimated $10,000 to $50,000 annually per child depending on the child's body weight. American Academy of Pediatrics Comm. on Drugs and Bioethics, *Consideration Related to the Use of Recombinant Human Growth Hormone in Children*, 99 PEDIATRICS 122, 125 (1997). The cost of the hormone products might decline once they lose their current status as orphan drugs, which confers on the manufacturers a period of marketing exclusively, thereby preventing price competition. *See id.*

47. Amniocentesis and CVS each cost approximately $1,800. *See* Carolyn Poroit, *Prenatal Tests Help Prepare Moms-to-Be*, CINCINNATI ENQUIRER, Apr. 15, 1998, at E03.

48. The social and policy implications this raises are beyond the scope of this article, but it is important to keep them in mind. To take but one example, some advocates for the less well-off argue that the government should subsidize genetic testing and abortions under programs such as Medicaid. *See* David T. Morriss, *Cost Containment and Reproductive Autonomy: Prenatal Genetic Screening and the American Health Security Act of 1993*, 20 AM. J.L. & MED. 295, 313 (1994) ("[I]f an indigent woman receiving health care coverage under Medicaid is found to be carrying a fetus with a major genetic defect, she has no alternative but to carry the pregnancy to term unless she is able to pay for an abortion herself."). If this occurs, and genetic testing extends beyond detection of abnormalities or disorders to "normal" traits, then the government's involvement smacks of eugenics. Yet it may be difficult to restrict government-funded genetic testing to abnormalities, especially in view of the vagueness of that term as described *supra* note 19.

rently costs an average of $37,000 per delivery,[49] onto the cost of the genetic manipulations themselves. Moreover, these manipulations are likely to cost substantially more than the costs of *in vitro* fertilization (particularly when the technology is first introduced).

It is unlikely that public or private health insurance will cover the costs of genetic enhancement. This assessment seems plausible because insurance policies do not cover costs associated with cosmetic medicine, the most analogous biomedical technology currently available. The legislation governing the Medicare program contains a general prohibition against paying for "items or services . . . which are not reasonable and necessary for the treatment of illness, or to improve the functioning of a malformed body part,"[50] and includes a specific exclusion for "cosmetic surgery."[51] Some states adopted the same coverage exceptions under their Medicaid programs.[52] Additionally, private health insurance plans do not cover cosmetic medicine; the language in the author's high-option Blue Cross policy is typical: "Coverage is not provided for services and supplies . . . for surgery and other services primarily to improve appearance or to treat a mental or emotional condition through a change in body form. . . ."[53]

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49. *See* NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 60.

50. 42 U.S.C. §1395y(a)(1)(A) (1994).

51. *Id.* §1395y(10).

52. Federal Medicaid legislation does not contain the same funding limitations as Medicare, but instead "confers broad discretion on the States to adopt standards for determining the extent of medical assistance, requiring only that such standards be 'reasonable' and 'consistent with the objectives' of the Act." Beal v. Doe, 432 U.S. 438, 444 (1977). State Medicaid agencies "may place appropriate limits on a service based on such criteria as medical necessity." 42 C.F.R. § 440.230(d) (1998). State Medicaid programs generally refuse to cover cosmetic services. *See, e.g.*, MASS. GEN. LAWS ANN. ch. 118G, § 1 (West 1993 & Supp. 1998) ("[M]edically necessary services shall not include: . . . cosmetic surgery."); Viveros v. Dep't of Health & Welfare, 889 P.2d 1104, 1107-08 (Idaho 1995) (finding Idaho Department of Welfare's exclusion of "cosmetic surgery which is not medically necessary" not arbitrary and capricious).

53. Comprehensive Major Medical Health Care Certificate, Case Western Reserve University (Med. Mutual of Ohio), June 17, 1997, at 19 (on file with author). The latter language responds to the attempt of physicians and patients to force insurers to cover cosmetic surgery on the basis that it is intended to alleviate patients' emotional distress at their physical appearance. In *Viveros*, for example, the court upheld the refusal of the state Medicaid program to pay for surgery to reduce the size of the ears of an eight year-old with developmental disabilities despite claims that the teasing he was subjected to would damage his self-esteem. *Viveros*, 889 P.2d at 1108. State officials took the position that they would only pay for the surgical procedure if the condition of the boy's ears impaired his hearing. *Id.* at 1107.

Some private health insurance plans cover infertility treatments, and under so-called "state mandates," some states require health plans to provide this coverage. *See, e.g.*, ARK. CODE ANN. § 23-86-118 (Michie 1992); CAL. INS. CODE § 10119.6 (West 1993); CONN. GEN. STAT. ANN. § 38a-536 (West 1992); HAW. REV. STAT. § 431-10A-116.5 (1993); 215 ILL. COMP. STAT. ANN. 5/356m (West 1993); MASS. GEN. LAWS ANN. ch. 175, § 47H (West 1987 & Supp.

Against this backdrop, it is unlikely that third-party payers will change their policies and cover genetic enhancement in the future. Private insurers would not add coverage unless all insurers did so, since otherwise they would face destructive price competition from plans that denied coverage.[54] Yet the cost of providing universal coverage of genetic enhancements, whether through private insurers or the government, would be prohibitive.[55] For example, widespread access to enhancements that depended on *in vitro* fertilization, like pre-implantation genetic selection, would cost $120 billion per year *for the in vitro fertilization services alone*.[56] Somatic enhancement would not be any less expensive. A single somatic enhancement, such as human growth hormone, which costs an average of $30,000 per child per year,[57] would cost $22 billion a year just for the 1.7 million children who comprised *the shortest three percent of the population*.[58] The cost of multiple somatic enhancements for the entire population over time would be astronomical.

The high cost and lack of coverage by third-party payment plans does

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1998); TEX. INS. CODE. ANN. § 3.51-6 (3A(a)) (West 1981). Therefore, if genetic enhancement were sought in conjunction with IVF for infertility, a portion of the costs—at least of the IVF procedure itself—might be covered by insurance. But insurers would not pay for the costs of genetic enhancement, or for the costs of IVF if the primary reason for it was genetic enhancement, if the insurer could discern these facts from the claim or the request for pre-certification of the service. Moreover, under the Employee Retirement Income Security Act (ERISA), health plans provided by employers on a self-insured basis are exempt from state mandates. *See* 29 U.S.C. § 1144(a) (1994) (preempting "any and all State laws insofar as they may now or hereafter relate to any employee benefit plan" governed by ERISA); *see also id.* §1144(b)(2)(A) (saving state laws that regulate insurance from preemption); *id.* §1144(b)(2)(B) (deeming self-insured employer plans not to be engaged in the business of insurance and having the net effect of exempting self-insured plans from state regulation of insurance and managed care plans). In 1993, approximately 44 million persons were covered under these self-funded plans governed by ERISA. *See* GOVERNMENT ACCOUNTING OFFICE, EMPLOYER-BASED HEALTH PLANS: ISSUES, TRENDS, AND CHALLENGES POSED BY ERISA 9 (1995).

54. This stems from the problem of self-selection. An insurer that covered genetic enhancements when other plans did not would tend to attract precisely those enrollees who planned to use these costly services away from the other plans. This would require the insurer to raise premiums above those of plans that did not cover enhancement services to the point that any competitive advantage would be lost.

55. Bear this in mind later in the discussion of whether the government ought to provide genetic enhancement to persons with disabilities in order to improve their lot in life. *See infra* notes 117-23 and accompanying text.

56. This figure is based on an average cost of $30,000 per *in vitro* fertilization effort for approximately 4,000,000 live births per year. *See* U.S. DEP'T OF HEALTH & HUMAN SERVS., HEALTH UNITED STATES 82, tbl.3 (1995). This excludes unsuccessful pregnancies, which also might have involved enhancement efforts.

57. *See* Cuttler et al., *supra* note 8, at 532.

58. *See id.* (exploring current recommendations over the use of growth hormone to treat children).

not, however, suggest that no one will gain access to genetic enhancement. Rather, it merely suggests that, if left to the forces of the marketplace, access will be limited to persons who can purchase it with their own assets. Society will thus divide into those who can afford genetic enhancements and those who can afford little, if any, just as it now divides into those who can and cannot afford cosmetic surgery, prolonged psychotherapy, or private schools.[59]

This resulting division will give rise to two related problems. The first is the problem of *social inequality*. Enhanced individuals will achieve social success more easily than those who remain unenhanced. For example, studies show that people who are tall and physically attractive are more likely to be hired and promoted than people who are short or unattractive.[60] Although Western democratic societies can accommodate a certain degree of inequality, the difference in prospects between the enhanced and the unenhanced could become so pronounced that serious social instability would ensue. Taken to the extreme, enhancements could be installed by manipulating germ lines, resulting in social advantages that are inherited by succeeding generations. This could eventually create a political system dominated by a genetic aristocracy, or "genobility," that possesses a lock on wealth, privilege, and power.

The second problem created by wealth-based access to genetic enhancement is the individual *unfairness* that would arise at the micro level if genetically enhanced individuals competed for scarce resources, or found themselves in conflicts of interest, with persons who were unenhanced. Ge-

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59. An important question is whether the societal division would be dichotomous or whether there would be a sort of "enhancement middle class" comprised of persons who could afford some enhancement but not as much as those with more wealth. This depends on the actual cost of genetic enhancement and on the distribution of wealth in the population. For purposes of this paper, I will assume that even if a relatively large number of people could afford some genetic enhancement, what they can afford will confer relatively little benefit compared to the enhancement benefits that will be obtainable by the wealthy. This assumption is supported by trends in the societal distribution of wealth. In 1996, the top five percent of households saw their proportion of national income rise to 21.4%, the highest level ever reported by the Census Bureau, while the shares of national income going to the bottom four-fifths of the population were at or near all-time lows. *See* Center on Budget and Policy Priorities, *Poverty Rate Fails to Decline as Income Growth of 1997 Favors the Affluent* (last modified Oct. 14, 1997) <http://www.cbpp.org/povday97.htm>.

60. *See* Daniel S. Hamermesh & Jeff E. Biddle, *Beauty and the Labor Market*, 84 AM. ECON. REV. 1174, 1192 (1994) ("Other things equal, wages of people with below-average looks are lower than those of average-looking workers and there is a premium in wages for good-looking people that is slightly smaller than this penalty."); Paula C. Morrow, *Physical Attractiveness and Selection Decision Making*, 16 J. MGMT. 45 (1990) (reviewing studies and finding a correlation between physical attractiveness and hiring practices). In addition to hiring preferences, attractiveness and income appear to be correlated as well.

netic enhancement could confer a decisive advantage in social interactions. How should society respond to the potential unfairness of these interactions?

In the next section, I focus briefly on why the inequality and fairness issues presented by genetic enhancement are likely to be serious, if not unprecedented. I argue that the potential benefits from genetic enhancement differ sufficiently from other forms of self-improvement that specific attention must be given to the problems of inequality and unfairness that genetic enhancement produces. I then turn to an elaboration of the problem of inequality, followed by an evaluation of potential methods for mitigating the inequality that wealth-based access to genetic enhancement would produce. Because some individuals are bound to obtain access to genetic enhancement, I address the problem of unfairness, and conclude with a discussion of potential methods for leveling the genetic playing field in specific transactions.

II. THE SPECIAL NATURE OF GENETIC ENHANCEMENTS

In any society whose members believe in the possibility of upward social mobility, people seek to better themselves and their children.[61] They educate themselves and attempt to obtain the best education for their children. They may try to marry "upward," hoping for a mate who will increase their opportunities, social standing, and wealth. They push themselves and their children to cultivate and make the utmost use of their talents.[62]

Many of these efforts involve the employment of medical or pharmaceutical interventions. People take drugs to improve their athletic and cognitive performance.[63] They subject themselves to surgery to improve their appearance.[64] Some of these activities, selecting one's mate, for example,

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61. *See* Achy Obejas, *Self-Help Radio: Local Station Says New Feel-Good Format Is Smart Enough, Good Enough, and Doggone It, People Like It*, CHI. TRIB., Mar. 9, 1998, at 2 (describing WYPA, a local radio station in Chicago, which touts itself as "your transformation station," offering "a constant diet of 'success skills,' 'healthy lifestyles,' and 'business skills.'").

62. Sometimes they go to extremes. *See Cheerleader Case Sentence*, N.Y. TIMES, Sept. 10, 1996, at A23 ("A woman who offered her diamond earrings in a murder-for-hire plot aimed at getting her daughter on the junior high cheerleading squad was sentenced to 10 years in prison today."). In order to increase their toddler's chances of getting admitted to an exclusive pre-school in Manhattan, parents repeatedly fed her okra prior to the admissions interview in the hope that the answer "okra" to the question "What are your favorite foods?" would give her an advantage. *See* Jane Mayer, *It Helps to Thank Headmistress When She Offers Cookies*, WALL ST. J., Sept. 29, 1982, at 1.

63. *See* discussion at notes 19-24, *supra*, and accompanying text (discussing various types of enhancements).

64. Cosmetic surgery includes breast augmentation and reduction, liposuction, rhinoplasty, and face-lifts. Liposuction has become increasingly popular in recent years, with a 215% increase in persons obtaining liposuction from 1992 to 1997. *See* American Society of Plastic

have at least an indirect influence on the genetic makeup of succeeding generations.

Considering that individuals currently employ enhancement practices, what is so exceptional about genetic enhancement? Society has had plenty of experience coping with the social implications of efforts at self-improvement. While society's response has not always been adequate or successful,[65] we must consider whether the problems created by genetic enhancement will be so different that they require special attention.

Even if we believed that wealth-based access to genetic enhancement did not constitute a new kind of threat to social equality, we might still want society to respond to its vices in a vigorous fashion. The additional inequality arising from genetic enhancement, when added to existing sources of inequality, might lead to social unrest. At the very least, we might want to monitor the situation closely, and stand prepared to respond if necessary.

Yet in a number of important respects, genetic enhancement *does* differ from previous agents of inequality and unfairness. Taken together, these differences justify a significantly heightened level of concern, if not outright alarm.

First, due to its expected cost, only a select group of wealthy individuals will gain access to genetic enhancement technologies. Currently, numerous types of self-improvement, while often expensive, are not priced beyond the means of most people. For example, 20 million Americans are members of commercial health and sports clubs.[66] Arguably, cosmetic surgery is within the financial means of a wide range of people. For example, in 1997, 480,588 persons purchased some type of cosmetic surgery.[67] By contrast, only 39,390 per year obtain *in vitro* fertilization,[68] and even fewer would be able to afford the additional cost of pre-implantation genetic enhancement. Somatic enhancement might be cheaper, but might still be

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and Reconstructive Surgeons, *Media Center: Five Year Trends in Cosmetic Surgery 1992 vs. 1997* (visited May 12, 1998) <http://www.plasticsurgery.org/mediactr/97change.htm>. The surgical procedures often seem extreme. In a complete face-lift, for example, the entire face is peeled away from the skull to enable the skin to be pulled back and reattached more tightly. *See* Joan Swirsky, *A New Method in the Old Practice of Making a Younger Face*, N.Y. TIMES, May 8, 1994, § 14LI, at 10 (describing traditional methods of cosmetic surgery).

65. Witness the difficulties in trying to control the use of performance-enhancing drugs in sports.

66. *See* U.S. NEWS & WORLD REP., May 13, 1996, at 20.

67. *See* American Society of Plastic and Reconstructive Surgeons, *1997 Cosmetic Procedures* (visited May 12, 1998) <http://www.plasticsurgery.org/mediactr/97change.htm>. The procedures reflected in this figure are liposuction, breast augmentation, eyelid surgery, facelift, and laser skin resurfacing.

68. The number of deliveries as a result of these cycles of IVF were far fewer: 9,573. *See* Richard J. Paulson, *Assisted Reproductive Technologies*, 165 W. J. MED. 377, 377 (1996).

beyond the reach of many who desire to enhance multiple traits or produce long-term results.[69]

Second, genetic enhancements are likely to affect some traits that are not easily altered by current forms of self-improvement, which are limited in scope. These traits may include some that are fundamental to personal success. For example, one can change one's weight (although usually not permanently); use cosmetics and cosmetic medicine to improve appearance within certain limits; moderately increase one's ability to cope with loss, failure, and stress; build muscles; develop greater physical, mental, and social skills; and increase reading speed. Genetic enhancement, however, may improve intelligence, cognition, charisma, creativity, energy, cheerfulness, sense of humor, and other characteristics that are arguably central to success and well-being.[70]

In addition, people who are fortunate enough to gain access to genetic enhancements are likely to obtain a much greater and longer-lasting advantage than those who employ more traditional forms of self-improvement. The athletic use of performance-enhancing drugs does not alter the basic human phenotype, and the effects, while perhaps enough to win competitions, are relatively modest.[71] Although cosmetic interventions

69. Individuals seeking cosmetic surgery for frown lines must be injected with *Botulinum* toxin (Botox), one of the deadliest toxins known to man, every few months to get rid of frown lines. *See* Kendell Hamilton & Julie Weingarden, *Lifts, Lasers and Liposuction: The Cosmetic Surgery Boom*, NEWSWEEK, June 15, 1998, at 14. Performance-enhancing drugs such as anabolic steroids must be taken every 24 hours to enhance performance. Lamb, *supra* note 31, at 32 (demonstrating that weight-trained athletes will use anywhere from 10-15mg/24 hours to 2000mg/24 hours). The acute effects of human growth hormone disappear within three to four hours. *See* Smith & Perry, *supra* note 9, at 653-54.

70. Ronald Dworkin prominently addresses the treatment to be accorded natural but not acquired traits. The distinction is reflected in his twin essays, *What Is Equality? Part 1: Equality of Welfare* [hereinafter Dworkin I], and *What Is Equality? Part 2: Equality of Resources* [hereinafter Dworkin II], *in* 10 PHIL. & PUB. AFF. 185, 283 (1981). *See* JOHN E. ROEMER, THEORIES OF DISTRIBUTIVE JUSTICE 237 (1996) ("Dworkin argues that justice requires compensating individuals for aspects of their situations for which they are not responsible and which hamper their achievement of whatever is valuable in life, but only for those aspects."). In perhaps the most significant attempt to justify such a societal response, Rawls posits a veil of ignorance behind which individuals choosing the rules by which to govern their society do not know their allotment of natural traits. *See* JOHN RAWLS, A THEORY OF JUSTICE 12 (1971) ("[N]o one knows his place in society. . . . [T]he principles of justice are chosen behind a veil of ignorance."); *see also* ROEMER, *supra*, at 175-76 ("[T]he veil of ignorance is only supposed to shield individuals from knowledge of their morally arbitrary features.").

71. Improvement in muscular strength from steroid use has been shown in only one-half of the controlled investigations reported. "When positive effects of steroid treatment were observed, steroids typically led to increase of 8 kg for maximal lifts in the bench press and 11 kg in the squat." Lamb, *supra* note 31, at 31. Sodium bicarbonate, which enhances performance by delaying fatigue, helps to buffer the build-up of lactic acid within the muscle cells. One study showed that sodium bicarbonate could increase a runner's speed by 2.9 seconds, which

change the appearance, they rarely stray from "normal" ranges for physical traits, and with the exception of cosmetic surgery, are often transitory.[72] To date, techniques for improving memory and other cognitive functioning do not appear to significantly increase intelligence, or to have a particularly profound or permanent effect on the individual.[73] It is impossible, however, to predict the power of genetic enhancement. It could stretch the limits of desirable human traits considerably, perhaps even indefinitely.[74] For example, there eventually may be no such thing as being "too intelligent." Moreover, enhanced persons could still employ traditional forms of self-improvement *in addition* to their genetically enhanced starting points.

Further, current self-improvement techniques tend to affect only a few aspects of performance or appearance at one time. In most cases, people work on one trait—their facial appearance, their weight, their ability to solve puzzles or memorize facts, and so on. Cosmetic polymedicine, while not unknown, is rare.[75] Even a professional athlete in full training mode can do no more than exercise and take performance-enhancing drugs to increase strength and stamina, hire a good coach and perhaps a sports psychologist, and repeatedly practice a skill or routine. Genetic enhancement on the other hand may permit wholesale changes in characteristics. Parents with sufficient resources may engineer numerous improvements in them-

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could be the difference between first and last place. *See* Ghaphery, *supra* note 31, at 433 (explaining the effects of various drugs on the athletes' performance). Blood doping, the intravenous infusion of blood to increase oxygen-carrying capacity, has been shown to increase endurance by 15-30%. Amphetamines, which are used to increase speed, power, and endurance, have been shown to enhance "performance by 3-4% in weight throwers and shot-putters, 1.5% in runners, and 0.6-1.2 % in swimmers." Smith & Perry, *supra* note 9, at 654. Epoetin, a genetically engineered human recombinant erythropoietin that stimulates red blood cell production, can cut up to 30 seconds from a 20-minute racing time. *Id.* at 657.

72. *See* ELIZABETH HAIKEN, VENUS ENVY: A HISTORY OF COSMETIC SURGERY 223 (1997) (discussing the tendency of cosmetic surgery to lead to homogenization). The exception might be entertainers, particularly those who trade on their sexual appearance.

73. Memory enhancement has become the latest fitness boom. Techniques to improve memory such as Kevin Trudeau's "Mega Memory" and Jack Lannom's "Mind Unlimited" are in high demand. Supplements such as ginkgo biloba, estrogen, vitamin E, and aspirin are claimed to boost brain power. There is "nothing magical," however, about the techniques that these memory coaches teach. Furthermore, few of the supplements that enthusiasts have embraced have been shown to sharpen recall in healthy people, and some have been shown to have dangerous side effects. *See* Geoffrey Cowley & Anne Underwood, *Memory*, NEWSWEEK, June 15, 1998, at 54. *See generally* Whitehouse et al., *supra* note 20, at 22 (discussing side effects of drugs that enhance cognition).

74. *See* Whitehouse et al., *supra* note 20, at 16 (asking if cognition is similar to the proposition that "[o]ne can never be too rich or too thin").

75. *See What Price Perfection?*, ORLANDO SENTINEL, Oct. 12, 1991, at E2 ("[T]he need for plastic surgery over the entire body is minute.").

selves and in their children.[76]

Genetic enhancements may give people decisive advantages or major success not just in one or two spheres of social activity, but in a broad range of social endeavors, since genetic enhancement may make it possible to alter multiple traits in significant ways. This may enable them to cross what Michael Walzer calls "spheres of distributive justice."[77] Walzer encourages imagining the following individual:

> Here is a person whom we have freely chosen (without reference to his family ties or his wealth) as our political representative. He is also a bold and inventive entrepreneur. When he was younger, he studied science, scored amazingly high grades in every exam, and made important discoveries. In war, he is surpassingly brave and wins the highest honors. Himself compassionate and compelling, he is loved by all who know him.[78]

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76. As Eric Parens points out, genetic enhancement is not just a new technological product that can be purchased by people who are lucky in terms of their genetic "draw"; instead, it is a means of improving the genetic draw itself, a chance to purchase a new "capacity" rather than just a new "tool":

> In the past the rich have had access to new technological tools that enabled them to increase their productivity and thus their resources. Access to the tool that is the printing press, for example, no doubt conferred a competitive advantage on those who could afford access to it and its products. But how much one could benefit from those new tools and products was to some extent limited by one's draw in the genetic lottery. . . . One of the things about the new biotechnologies is that one's draw does not pose the same sort of limitation.

Erik Parens, *Is Better Always Good? The Enhancement Project*, 28 HASTINGS CTR. REP. S8 (Jan.-Feb. 1998).

It is necessary to note that multiple somatic enhancements might interfere with one another or otherwise adversely affect the health or well-being of the person in whom they were installed. Furthermore, genetic enhancement techniques that involve reproductive decision-making, guided by the results of genetic testing, are likely to be able to improve relatively few traits compared to gene transfer enhancement. This is true largely because parents or prospective parents making reproductive decisions would have few choices of mates, embryos, or fetuses to enable them to consider more than a few concurrently manifesting characteristics.

77. MICHAEL WALZER, SPHERES OF JUSTICE 10 (1983).

78. Walzer argues that a society without a dominating class that stands atop the distributive system, *id.* at 11, is a society in which there are no monopolistically owned dominant goods, that is, goods owned by one group that can command a wide range of goods in other spheres of society. *Id.* at 20. Walzer asserts as an "open-ended distributive principle" that "[n]o social good x should be distributed to men and women who possess some other good y merely because they possess y and without regard to the meaning of x" *Id.*. In a just society, for example, wealthy people cannot purchase political office, since this would convert a good in one distributive sphere—wealth—into a good in another sphere—political power. But what about people who are so gifted that they dominate by virtue of their talents? What would happen, asks Walzer, if "the same people were successful in one sphere after another, triumphant in

If genetic enhancement made this type of person possible, he and his kind would very likely dominate the rest of society.

Finally, unlike most advantages derived from self-improvement, certain genetic enhancements—those that are achieved through genetic selection for enhancement or germ line engineering—will be incorporated into the genetic make-up of future generations.[79] Both the genetic enhancements and the societal advantages conferred will be inherited and persons who obtain them will comprise a special social class. Although initially defined by its wealth, this class will eventually be characterized by its superior genetic endowment.

In short, genetic enhancement raises numerous societal concerns.[80]

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every company, piling up goods without the need for illegitimate conversions?" *Id.* Their society would not only be inegalitarian, but it would be a society in which equality was not possible. *See id.* (stating that "it would also suggest in the strongest way that a society of equals was not a lively possibility"). Walzer dismisses this scenario as unrealistic, contending that such individuals do not exist outside of legend. *Id.* Even if they do exist, he adds, "there aren't enough such people to constitute a ruling class and dominate the rest of us." *Id.* Yet genetic enhancement, which is affordable only by the wealthy and inherited by their offspring, creates just such a scenario. Similar to Walzer, Robert Nozick also believes that the fact that people excel at different things avoids excessive envy. *See* ROBERT NOZICK, ANARCHY STATE AND UTOPIA 243-46 (1974).

79. Non-genetic types of self-improvement may have indirect effects on future generations. A star athlete who achieves fame and fortune through self-improvement may be able to mate with someone with highly desirable genetic characteristics, positively affecting the genetic endowment of their children, who will also benefit from the wealth and status that he or she inherits from his or her successful parent. Yet this genetic impact is indirect as compared with the impact of a genetic selection or manipulation. Note that replicating a genetic enhancement in future generations may require further manipulations, since the DNA of the enhanced individual would combine with the DNA of the sperm or egg of the other mate (assuming sexual reproduction), which might not be enhanced or enhanced in the same fashion.

The negative social effects of genetic enhancement are likely to be less well-understood, and may be far more profound and long-ranging, than the effects produced by other methods of self-improvement. The adverse impact on children of being genetically enhanced by their parents, if any, is not clear, and there is little in the way of precedent. For example, many parents seek growth hormone therapy for their children because they feel that being made taller will benefit the child. Human growth hormone, however, can have some very serious adverse physical and psychological effects. There has been evidence that human growth hormone may lead to diabetes, production of growth-attenuating antibodies, leukemia, acromegaly, and hypertension. It also has a stigmatizing effect because children may perceive themselves as incomplete or unacceptable. This in turn may impair their ability to concentrate on learning, social relationships and other developmental essentials. *See* Douglas S. Diekema, *Is Taller Really Better? Growth Hormone Therapy in Short Children*, 34 PERSP. IN BIOLOGY & MED. 109, 112-13 (1990). *See generally* MURRAY, *supra* note 23, at 90-91 (discussing adverse effects on children of human growth hormone). No one knows what effects genetic enhancement may have on successive generations, especially changes in the gene pool itself produced by germ cell enhancement.

80. Among other concerns are the authenticity of the achievements of an enhanced indi-

Some of these are metaphysical. For example, genetic engineering generally is criticized as "playing God."[81] Critics with this perspective may be even more hostile toward genetic enhancements, which aim to improve "normal" traits, rather than to cure, mitigate, or prevent disease or disability. Beyond philosophical objections, however, genetic enhancement may have significant, adverse practical consequences for individuals and for society as a whole. In the remainder of this article, I will concentrate on two of these practical consequences, beginning with the implications for social equality.

III. THE THREAT TO EQUALITY FROM GENETIC ENHANCEMENT

Is it fair for some people to have greater genetic advantages than others? This is an age-old question, forming the crux of the problem of "natural inequality" that has plagued philosophers and social theorists for centuries.[82] If it is unfair, then presumably society should do what it can to mitigate the consequences. Yet, what forms of intervention should society take, and how feasible would they be?

Some philosophers tolerate natural inequality more than others. Meritocrats, for example, welcome the substantial inequalities that result from the distribution of natural talents, arguing that society benefits from the accomplishments of the gifted. John Gardner objects to what he calls

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vidual and violating the autonomy of embryos, fetuses, and children who cannot make enhancement decisions for themselves. *See* Glenn McGee, *Parenting in an Era of Genetics*, 28 HASTINGS CTR REP. 16 (Mar.-Apr. 1997) (emphasizing the possibility that children will be born into a world where their ultimate choices have already been made by their parents); Parens, *supra* note 76, at S11-S13.

81. *See* Capron, *supra* note 18, at 672 (describing the views of religious scholars on genetic engineering presented to President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research); Elliot N. Dorff, *Jewish Theological and Moral Reflections on Genetic Screening: The Case of BRCA1*, 7 HEALTH MATRIX 72 (1997) (stating that "[t]heologically, the dilemma is to define when we cease legitimately to be God's partners in creation and instead become God's substitute, playing God, as it were, in changing the nature of the species").

82. Plato, for example, assumed that people were born into different conditions, which he categorized as gold, silver and bronze, and should be allowed to move up or down in society depending on their abilities. PLATO, THE REPUBLIC 160-61 (H. D. P. Lee trans., Penguin Books 1955). Some might say that natural inequality results not only from a person's genetic endowment but from any inherited benefit, such as class or wealth. Rawls, for example, includes both "accidents of natural endowment" and "contingencies of social circumstances" as undeserved advantages that must be nullified by his conception of justice. RAWLS, *supra* note 70, at 15. Yet genetic endowment in turn affects social circumstances, although the exact degree is dependent on the relative impact of genetic and environmental factors in any particular instance. *See supra* footnote 15 (discussing the nature-versus-nurture controversy). To the extent that natural advantages do not derive, directly or indirectly, from a person's genetic endowment, one might say that they are the result of pure luck.

"extreme equalitarianism," which "ignores differences in native capacity and achievement and eliminates incentives to individuals," and which, in his opinion, signifies "the end of that striving for excellence that has produced history's greatest achievements."[83] Others relish excellence as much for its own sake as for what it can achieve. According to Thomas Nagel:

> A society should try to foster the creation and preservation of what is best, or as good as it possibly can be. . . . Such an aim can be pursued only by recognizing and exploiting the natural inequalities between persons, encouraging specialization and distinction of levels in education, and accepting the variation in accomplishment which results.[84]

Robert Nozick disputes the belief that because natural assets are arbitrarily distributed, they are not deserved.[85]

Philosophers who are morally troubled by inequality, on the other hand,[86] take the position that it is unjust for some individuals to benefit by

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83. JOHN GARDNER, EXCELLENCE: CAN WE BE EQUAL AND EXCELLENT TOO? 30 (1984).

84. THOMAS NAGEL, EQUALITY AND PARTIALITY 135 (1991).

85. NOZICK, *supra* note 78, at 223-24. Nozick rejects the rationale underlying Rawls' conception of an "original position" in which individuals choose principles of justice behind a veil of ignorance where they are denied knowledge of their actual endowment of natural assets. States Nozick:

> Presumably the underlying principle would be that if any particular features are arbitrary from a moral point of view, then persons in the original position should not know they possess them. But this would exclude their knowing *anything* about themselves, for each of their features (including rationality, the ability to make choices, having a life span of more than three days, having a memory, being able to communicate with other organisms like themselves [all of which Rawls assumes they know about themselves in the original position]) will be based upon the fact that the sperm and ovum that produced them contained particular genetic material. The physical fact that those particular gametes contained particular organized chemicals (the gene for people rather than for muskrats or trees) is arbitrary *from a moral point of view*; it is, from a moral point of view, an accident. Yet persons in the original position are to know some of their attributes.

Id. at 227.

86. Equality is an important goal according to most conceptions of Western democratic society; witness the Declaration of Independence, asserting as a "self-evident truth" that "all men are created equal," or the statement in the United Nations Declaration of Human Rights that "[a]ll human beings are created equal in dignity and rights." Isaiah Berlin describes the innate appeal of the principle in the following passage, as excerpted by Robert Nozick:

> No reason need be given for . . . an equal distribution of benefits—for that is "natural"—self-evidently right and just, and needs no justification, since it is in a sense conceived as being self-justified . . . . The assumption is that equality needs no reasons, only inequality does so; that uniformity, regularity, similarity, symmetry, . . . need not be specially accounted for, whereas differences, unsystematic behavior, changes in conduct, need explanation

> and, as a rule, justification. If I have a cake and there are ten persons among whom I wish to divide it, then if I give exactly one-tenth to each, this will not, at any rate automatically, call for justification; whereas if I depart from this principle of equal division, I am expected to produce a special reason. It is some sense of this, however latent, that makes equality an idea which has never seemed intrinsically eccentric. . . .

Id. at 347 n.41 (quoting Isaiah Berlin, *Equality*, *in* JUSTICE AND SOCIAL POLICY 131 (Frederick A. Olafson ed., 1961)) (alteration in original).

Yet the notion of equality itself is highly imprecise. Temkin, for example, describes nine different ways of expressing social inequality:

1. The range, consisting of the gap between the levels of welfare of the best and worst off in society.
2. The relative mean deviation, consisting of the sum of the differences between the average level of welfare and the welfare of each individual.
3. The variance, consisting of the sum of the squared differences between the average level of welfare and the welfare of each individual.
4. The coefficient of variation, consisting of the square root of the squared differences between the average level of welfare and the welfare of each individual.
5. The standard deviation of the logarithm, consisting of the squared logarithmic differences between the average level of welfare and the welfare of each individual.
6. The Gini coefficient, consisting of one-half of the relative mean difference (the arithmetic average of the absolute difference) between the welfare of each individual.
7. Atkinson's measure, consisting of one minus the ratio of the equally distributed equivalent level of income to the mean of the actual distribution.
8. The intersection approach, suggested by Sen, in which the result of several measures of equality is considered.
9. Temkin's own approach, which is "complex and multifaceted" and involves identifying each material aspect of inequality, measuring it, weighting it in terms of its relative importance, and summing the results.

See LARRY S. TEMKIN, INEQUALITY 118-53 (1993) (summarizing nine different ways of expressing social inequality). Temkin explains the differences between these measures in terms of their sensitivity to the complexities of actual society in which different individuals have different levels of welfare. The range ignores the pattern of distribution between the extremes, so that it would regard a society in which a few people were extremely well-off and a few extremely poor as less equal than a society in which many people were less well-off, only less extremely so, and many people were more well-off, only less extremely so. The relative mean deviation ignores the effect of transfers of well-being between people below the welfare mean, even though such a transfer may violate the Pigou-Dalton condition (which holds that, other things being equal, transfers from poor to rich increase inequality, while transfers in the reverse direction decrease it). *See* A.C. PIGOU, WEALTH AND WELFARE 24 (1912); Hugh Dalton, *The Measurement of Inequality of Incomes*, 30 ECON. J. 48 (1920). The squaring feature of the variance, the coefficient of variance, and the standard deviation of the logarithm all give larger differences of welfare greater weight than smaller differences, but Temkin objects that they are arbitrary and that they generally fail to take account of highly complex welfare distributions. The Gini coefficient, along with some of the other measures, he argues, fails to reflect accurately the extent to which inequality matters more among the less well-off than among the better-off. Atkinson's measure, he says, is too flexible: It would consider a society to have a high degree of "equality" even though welfare was extremely unequally distributed, depending on the value one attached to an equal distribution of welfare. Finally, Sen's intersection approach is too prone to producing conflicting results. *See generally* TEMKIN, *supra* at 118-53,

virtue of their genetic endowment, as compared to others who do not fare as well in the arbitrary genetic lottery.[87] These philosophers generally agree that unchosen and unearned advantages and disadvantages must be minimized or used for the advantage of less fortunate members of society. As Rawls states: "It seems to be one of the fixed points of our considered judgments that no one deserves his place in the distribution of native endowments, any more than one deserves one's initial starting place in society."[88]

Although liberal philosophers agree on the goal of rectifying the injustices of the natural lottery, they disagree substantially on how this should be achieved. A basic dispute, for example, concerns just what is to be equalized: Is it "welfare," that is, some subjective measure of well-being, or is it "resources"?[89] Another contentious issue is how much inequality society

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87. Dworkin, for example, argues that society should rectify inequality of resources that results from what he calls "brute luck," which he defines as how risks fall out that are not "deliberate and calculated gambles." In contrast, society owes nothing to someone who has less by virtue of such gambles, which Dworkin calls "option luck." *See* Dworkin II, *supra* note 70, at 293.

88. RAWLS, *supra* note 70, at 104. This leads Rawls to opt for a "principle of redress" in regard to these attributes: "This is the principle that undeserved inequalities call for redress; and since inequalities of birth and natural endowment are undeserved, these inequalities are somehow to be compensated for." *Id.* at 100. Indeed, Rawls' difference principle itself—the principle that "[t]hose who have been favored by nature, whoever they are, may gain from their good fortune only on terms that improve the situation of those who have lost out," *id.* at 101,—derives from this view of natural endowments as undeserved. *See also* Ronald Dworkin, *Why Liberals Should Care About Equality*, *in* A MATTER OF PRINCIPLE 205, 207 (1985) ("[M]arket allocations must be corrected in order to bring some people closer to the share of resources they would have had but for these various differences of initial advantage, luck, and inherent capacity.").

89. Welfarist theories begin from the economists' premise that individual tastes and values differ. They hold that an equal distribution must strive to give everyone the resources necessary to make them equally happy or successful, or whatever is deemed to count as welfare even if the resulting distribution of resources is highly unequal. Advocates of equality of resources balk at the fact that equality of welfare may entitle persons with expensive tastes to receive an inordinate share of resources. A fuller description of this dispute is presented by Dworkin. *See generally* Dworkin I and Dworkin II, *supra* note 70. Dworkin's analysis in turn is succinctly described by ROEMER, *supra* note 70, at 237-52. Equality of resources attempts to solve this by providing everyone with the same bundle of goods. People with expensive rather than modest tastes will have to devote more of their resources to satisfying these tastes, but that, say resource egalitarians, is as it should be. However, equality of resources, in turn, raises the problem that some people will have expensive tastes over which they have little or no control—perhaps tastes that they inherited. Arguably they should no more be penalized for these tastes than for any other throw of the natural dice. Still other people will have plain bad luck, which will leave them worse off even though they have the same tastes and receive the same share of resources as those who are luckier.

It might seem that a scheme that aimed to provide equality of resources ought to

can tolerate, whether of welfare or resources, in order to assure the production of desired goods. For example, meritocratic, libertarian, and free market theorists all justify their tolerance for inequality, at least in part, on the ground that permitting people to profit from the exercise of their natural talents is necessary to induce them to increase the total sum of societal goods.[90] Therefore, many philosophers abandon the quest for absolute equality, whether of resources or welfare, in favor of providing everyone with a minimum level of assets or of well-being,[91] or with "equality of op-

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compensate for bad luck as well as for bad genes and other accidents of birth. Dworkin proposes such a scheme: "[A]n equal initial auction, followed by trade and production constrained by taxation mimicking hypothetical insurance markets . . . ." Dworkin II, *supra* note 70, at 335. The thrust of Dworkin's idea is that people should be given an equal amount of resources at an initial point at which they know their preferences and the general distribution of natural assets in the world, but not their personal allotment of natural assets or, of course, how lucky they will be. These people can, if they choose, purchase insurance that will compensate them if they receive a poor distribution of assets or encounter bad luck. The point of the insurance market is that it enables people to take into account their preferences, including their aversion to risk, in determining how much insurance to purchase. The insurance market thus transforms the natural lottery and luck into choices, which society no longer has to remedy. Roemer, however, observes that, if the goal is to remedy bad luck, then people deserve remediation when they purchase little or no insurance and have few natural talents or have bad luck. Otherwise, they will be worse off than someone who makes the same insurance choice but has many natural talents or good luck. *See* ROEMER, *supra* note 70, at 251-52.

90. *Cf.* NAGEL, *supra* note 84, at 121 ("Individual motives . . . work against equality . . . by putting pressure even on institutions that give priority to the interests of the worse off to tolerate substantial inequalities as the price of efficiency."). Even Rawls would permit substantial inequalities in order to increase production, so long as the benefits percolated down to the least well-off. *See* RAWLS, *supra* note 70, at 78, where he states:

> [T]he greater expectations allowed to entrepreneurs encourages them to do things which raise the long-term prospects of [the] laboring class. Their better prospects act as an incentive so that the economic process is more efficient, innovation proceeds at a faster pace, and so on. Eventually the resulting material benefits spread throughout the system and to the least advantaged.

Id.

91. Nagel, for example, asks why someone who is wealthy by virtue of good luck should not be permitted to enjoy his wealth, even though most people cannot have the same amount of wealth or enjoyment, so long as society guarantees everyone "a decent social minimum." NAGEL, *supra* note 84, at 136-37. He defines this standard as a "high social minimum, with healthy, comfortable, decent conditions of life and self-respect for everyone." *Id.* at 124. Nagel also insists that no one be excluded by discrimination from being able to acquire wealth. *Id.* at 137. Madison Powers and Harry Frankfurt advocate a principle of "sufficiency." The latter asserts that "[i]f everyone had enough, it would be of no moral consequence whether some had more than others." Harry Frankfurt, *Equality As a Moral Ideal*, 98 ETHICS 21 (1987), *quoted in* Madison Powers, *Forget About Equality*, 6 KENNEDY INST. ETHICS J. 129, 136 (1996). Powers holds that everyone should have sufficient resources "to prevent the subordination of some groups to the will of others." *Id.* at 143. Ronald Dworkin posits a hypothetical insurance scheme in which people who do not know what their talents or luck will be can buy insurance

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to protect themselves against bad fortune, and assumes that these people will purchase insurance to ensure that, regardless of their actual earning ability, they will earn a moderate wage. *See* Dworkin II, *supra* note 70, at 314-21. He suggests that this wage would approximate the earnings level of the thirtieth percentile of the population. *Id.* at 322. In terms of access to health care, Norman Daniels states that everyone should have enough health care to achieve a normal function or range of opportunities for their reference class (which will differ according to factors such as age and gender) within the species. *See* NORMAN DANIELS, JUST HEALTH CARE 28 (1986).

92. Falling back on equality of opportunity is a maneuver familiar to the law when confronting uncertainty over which outcomes are just. Instead of focusing on outcome, these arguments focus on process. What matters is not how equal or unequal everyone is, but how they achieved their relative positions. Inequality per se is not forbidden; only inequality that arises from discrimination is not tolerable. Nagel distinguishes, for example, between "the direct employment of talent to gain advantages" and "nepotism and bribery." NAGEL, *supra* note 84, at 118. Inequality stemming from the former is acceptable, since to prevent it "we would have to abolish competition," while "blocking the influence of discrimination and class, by contrast, expand competition." *Id.* Nozick, as noted earlier, would allow people to enjoy unequal holdings so long as the holdings were justly acquired. *See* NOZICK, *supra* note 78, at 151-52 ("A distribution is just if it arises from another just distribution by legitimate means."). "Unjust holdings" result when "people steal from others, or defraud them, or enslave them, seizing their product and preventing them from living as they choose, or forcibly excluding others from competing in exchanges." *Id.* at 152.

The most common process-based approach to the problem of inequality is to insist on "equality of opportunity." Michel Rosenfeld, for instance, asserts that equality of opportunity requires neutralization of inequalities of birth so that everyone has the same means to obtain scarce goods. *See* Michel Rosenfeld, *Substantive Equality and Equal Opportunity: A Jurisprudential Approach*, 74 CAL. L. REV. 1687, 1702 (1986). Equality of opportunity addresses not only the fact that some people invariably will have more than others, but the vexing problem of self-determination raised by the probability that, even if people had equal natural talents and an equal initial distribution of resources, they might not employ them with equal determination. Under equality of opportunity, an individual is responsible for both his or her sloth and timidity.

Richard Arneson thus advocates "equal opportunity for welfare," according to which everyone's welfare would be identical if they availed themselves of the maximally satisfying opportunity presenting itself at each stage of life. *See* Richard J. Arneson, *Equality and Equal Opportunity for Welfare*, 56 PHIL. STUD. 83, 83-84 (1989). Rakowski similarly proposes "equality of fortune." ERIC RAKOWSKI, EQUAL JUSTICE 138-39 (1991). He explains that "[e]quality of fortune maintains that people should have equally valuable resources and opportunities at their disposal except to the extent that their voluntary actions, including any gambles they freely take, give rise to inequalities." *Id.* at 138.

The doctrine of equality of opportunity also responds to an even more fundamental problem: the difficulty of distinguishing natural talent from effort and from talent developed through effort. Nagel, for example, observes that "it is impossible in practice to disentangle the effects of talent from the effects of effort, since effort is expended through the exercise of talent, and talent develops into a valuable ability through effort." NAGEL, *supra* note 84, at 119; *see also* Dworkin II, *supra* note 70, at 313, where he states:

> It might be helpful . . . if we were able to find some way of identifying, in any person's wealth at any particular time, the component traceable to dif-

> ferential talents as distinguished from differential ambitions. We might then try to devise a tax that would recapture, for redistribution, just this component. But we cannot hope to identify such a component, even given perfect information about people's personalities. For we will be thwarted by the reciprocal influence that talents and ambitions exercise on each other.

Since everyone has an equal opportunity, each person can make his or her own choices about how much effort to expend on developing his or her talents, and society can be indifferent to the mixture of effort and natural assets that produces the result.

There are many different forms of equality of opportunity. One is "political equality of opportunity," the idea embodied, for example, in the principle of "one person, one vote," or in the rules that permit anyone (meeting certain citizenship requirements, that is) to run for and hold public office. Another conception is "formal equality of opportunity," or the absence of legal obstacles to achieving a desired result, which Fullinwider defines formally as follows: "X and Y have equal opportunity in regard to [A] so long as neither faces a legal or quasi-legal barrier [to achieving A] the other does not face." Rosenfeld, *supra* note 92, at 1696 n.34 (quoting R. FULLINWIDER, THE REVERSE DISCRIMINATION CONTROVERSY 101 (1980)). Both of these approaches fail to assure true equality of social opportunity, an objective that is less clear in terms of what it means, whether it can be achieved, and whether its achievement is truly socially desirable.

Equality of opportunity runs into significant objections, however. Unless it is linked to some initial equality of resources and natural assets or to a distribution of "sufficient" welfare or resources, it appears to tolerate virtually unlimited inequality in terms of results. Compare Yuckel, who starts at Point A with a natural endowment valued at 50 and ends up at Point B with a value of 1000, with Grutz, who is equal to Yuckel in all respects except that Grutz begins at Point A with a natural endowment of only 10 and so ends up at Point B with a value of only 200. I am indebted to Faust Rossi for introducing me to Yuckel and Grutz.

Rosenfeld argues that the value of equality of opportunity is just that: It serves "as a legitimizing factor in the transition between inequality of initial circumstances [resulting from different backgrounds, experiences, and talents] and inequality of result." *Id.* at 1699. He proceeds to explain that equality of opportunity usually accomplishes this transition by requiring "equal means—that is, equal rules and equal tools." *Id.* (citing DOUGLAS RAE ET AL., EQUALITIES 66 (1981)). Temkin states:

> But John Schaar even thinks that equality of opportunity worsens inequality: In previous ages, when opportunities were restricted to those of the right birth and station, it is highly probable . . . that many of those who enjoyed abundant opportunities to develop their talents actually lacked the native ability to benefit from their advantages. Under the regime of equal opportunity, however . . . those who genuinely are superior in the desired attributes will enjoy rich opportunities to develop their qualities. This would produce, within a few generations, a social system where the members of the elites really were immensely superior in ability and attainment to the masses. We should then have a condition where the natural and social aristocracies would be identical.

TEMKIN, *supra* note 86, at 300 (quoting John H. Schaar, *Equality of Opportunity and Beyond*, *in* NOMOS IX: EQUALITY 228, 231-32 (R. Pennock and J. Chapman eds., 1967)). Nozick observes that "equality of opportunity has seemed to many writers to be the minimal egalitarian goal, questionable (if at all) only for being too weak." NOZICK, *supra* note 78, at 235. Much depends not only on whether any attempt is made to rectify initial positions, but on what opportunities are equalized, and how well the equalization is achieved. As Peter Westen notes, "[W]e believe in particular equal opportunities, just as we believe in particular unequal opportunities." Peter

Despite the gaps and imprecision in the numerous and competing theories of equality and their application, they provide a framework within which we may analyze the moral status of wealth-based genetic enhancement. For purposes of this analysis, the chief impact of genetic enhancement is that it transforms what were formerly thought of as "natural" traits—that is, those that are acquired through the operation of the arbitrary genetic lottery, over which individuals have no control—into "acquired" traits. This has several implications.

If genetic traits are natural, the possessor has no moral right to the benefits that they yield. An individual may be deprived of the benefits of his or her natural traits in order to improve the lot of others, or to achieve a more just distribution of welfare or resources, such as a more equitable distribution. If the individual is permitted to retain the benefits of natural traits, this can only be for one of several reasons: (1) retaining the benefits will not make others worse off; (2) requiring the individual to transfer some or all of the benefit to others will not increase their welfare or resources; (3) no one else has any greater right to the benefits; or (4) allowing the individual to retain the benefits is necessary in order to increase benefits for others, including society as a whole.

Once genetic traits are acquired, they become morally more ambiguous. They may have been acquired immorally, such as by exploiting the labor of others, in which case the benefits they confer may be relinquished in order to punish the possessor or to deter others. On the other hand, genetic enhancements may have been earned through diligence and effort. In this case, the possessor has a moral claim to retain the additional value created by enhancement, and can only be deprived of it on the basis of some overriding principle. In still other instances, the genetic trait may have been obtained in a morally neutral manner—neither by exploiting others, nor by being earned. Traits acquired in this manner resemble naturally acquired traits, in that the possessor has no moral claim to them.

Theories of equality also tend to agree that society has a responsibility to rectify or compensate people for the adverse effects that they suffer through the operation of the natural lottery. Increasing their welfare or resources is justified by the moral desirability of promoting equality, apart from any instrumental objective. At the same time, individuals are not entitled to be relieved of the burden of choices that they freely make, including the choices of which traits to acquire and how much of one's resources to spend on acquiring them.[93] Therefore, people who have the means to ge-

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Westen, *The Concept of Equal Opportunity*, 95 ETHICS 837, 850 (1985).

93. Note that the moral questionability of purchased genetic advantages cannot necessarily be cured by falling back on equality of opportunity, in the sense that everyone has the opportunity to purchase enhancements only if he or she has enough wealth. Everyone may

netically enhance themselves or their offspring but chose not to might not be entitled to remediation. This may have special implications when these individuals compete with enhanced individuals for scarce resources.

Applying this framework to wealth-based genetic enhancement yields a number of insights. Adults who purchased enhancements with immorally acquired assets would not be entitled to the benefits. Most would also agree that genetic enhancements are unearned when they are acquired from one's parents. The children have done nothing to entitle them to the advantages the enhancements yield; from a moral standpoint, their enhancement is no more than the luck of being born into a wealthy family.[94] In this

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have equality of opportunity in so far as he or she is free to purchase enhancements in the market, but the market price may place enhancements so far beyond most people's reach that the opportunity for them is no more than a theoretical possibility. *See* Westen, *supra* note 92, at 839 (noting that an "opportunity" must be more than a "mere possibility" but less than a "guarantee"); *see also* RAKOWSKI, *supra* note 92, at 1690 (arguing the same). The lack of sufficient wealth to purchase enhancement deprives people both of a realistic chance of obtaining it ("prospect-regarding equality of opportunity") and an equal ability to obtain it ("means-regarding equality of opportunity"). *See id* at 1696. As a practical matter, how much inequality stems from purchasing genetic advantages may depend in part on how expensive they are, i.e., how many people can afford to purchase them and on the distribution of wealth in society. In societies with large inequalities of wealth in which many people are barely able to subsist, few would be able to afford even relatively inexpensive genetic advantages. The resulting complexities are reflected in Temkin's discussion of relative degrees of inequality depending on the distribution of the relevant equalisand in society. He posits a series of 1000 worlds, each with 1000 inhabitants, which he calls "the Sequence," in which the populations vary in size according to their well-being. In the first world, 999 people are equally better-off and one is worse-off. In the last world, one person is better off and 999 are equally worse-off. Temkin asserts that the latter is more egalitarian than the former, since he contends that, as between two "reciprocal" worlds, the one with a larger better-off group is less egalitarian. Moreover, if one imagines a transition from the less to the more egalitarian world, and considers the middle world, in which half the people are equally better off and half equally worse off, Temkin argues, the transition from the first world to the middle marks a reduction in equality, which then is followed by an improvement. *See* TEMKIN, *supra* note 86, at 296-97.

94. *See* RAKOWSKI, *supra* note 92, at 159, where he observes:

> So far as gifts from parents to children are concerned, the approximation to cases of unadulterated good brute luck generally seems quite close. Children do not chose their parents. And although rebellious offspring may forfeit their parents' love, to the extent that they enjoy it and profit materially from it they do so largely because, in a society based on the nuclear family, they were through no merit of their own better placed to win their parents' affection than were other people. They also do so because parents often become attached to their progeny through the activities of procreation and child-rearing, for which attachment children are in no wise responsible, and because many parents feel, whether or not mistakenly, that they have a moral duty to provide generously for their children and to leave them the bulk of their property when they die. If these observations are correct, and if exceptions are not too numerous at whatever level formed the threshold for

case, enhanced genetic traits resemble natural traits. The goal of equality, therefore, would justify requiring the surplus to be shared with others, at least with those who had not voluntarily chosen to remain unenhanced. The same would be true of enhancements that adults purchased with "found" rather than earned wealth, such as from the proceeds of a lottery.

The case of the person who obtains the necessary funds by dint of the sweat of her brow, without exploiting others or behaving otherwise immorally, is more difficult. This person has a strong moral claim to the benefit gained from her genetic enhancements.[95] Similarly, a parent who earned the resources to purchase genetic enhancements for her children in morally acceptable ways may contend that her children ought to be entitled to enjoy the benefits.[96]

Can the goal of equality justify depriving these persons of the advantages conferred by their genetic enhancements? In some instances, to be sure, equality has trumped desert. Progressive income taxation, for example, redistributes earned wealth at least in part to promote economic equality. But the moral justification for depriving individuals of earned advantages is thin, and is likely too weak to sustain the measures necessary, as we shall see,[97] to level the genetic playing field. Implementing these measures requires that they be premised on something more than an abstract belief in the value of equality. They must be based on the conviction that genetic enhancement, if left unchecked, threatens liberal democracy.

Maintaining a liberal democratic form of government is an important social goal. This goal is directly threatened by wealth-based genetic enhancement: The inequality of social opportunity that results may be so great that a liberal democratic form of government becomes unsustainable, and our political system instead becomes autocratic or oligarchic. This fol-

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> redistributive transfers (a question one cannot well address in the abstract), then gifts from parents to children ought to be regarded largely as instances of good brute luck from the children's perspective and treated accordingly.

Id. It is precisely this lack of desert for inherited genetic enhancement that justifies a strong societal defense against resulting inequality.

95. This assumes that we can distinguish between the product of their labors and the product of their undeserved natural assets, which many believe is impossible. *See* NAGEL, *supra* note 84, at 119 (claiming "it is impossible in practice to disentangle the effects of talent from the effects of effort"). By unraveling the secrets of the human genetic code, ironically, the Human Genome Project in fact may reduce this difficulty by enabling a clearer picture of what accomplishments can be attributed to genetic factors rather than to pure effort.

96. There is an enormous amount of literature on the justice implications of estate taxation. For a recent collection of articles, see the Colloquium on Wealth Transfer Taxation in volume 51 of the *Tax Law Review*, especially Eric Rakowski, *Transferring Wealth Liberally*, 51 TAX L. REV. 419 (1996).

97. *See* discussion *infra* notes 157-204 and accompanying text (describing extensive and intrusive steps to promote equality).

lows from the assumption that a minimum degree of equality is necessary for the existence of a modern liberal democracy.[98] If social inequality becomes too pronounced, liberal democratic political systems, and the capitalist economic system upon which they rest, become unstable. As one sociologist states:

> Inequality in the distribution of rewards is always a potential source of political and social instability. Because upper, relatively advantaged strata are generally fewer in number than disadvantaged lower strata, the former are faced with crucial problems of social control over the latter. One way of approaching this issue is to ask not why the disprivileged often rebel against the privileged but why they do not rebel more often than they do.[99]

The characteristics of genetic enhancement that threaten to destabilize liberal democratic government are the features that distinguish genetic enhancement from other forms of self-improvement: its high cost, which may place it beyond the reach of all but the very wealthy;[100] the broad and fundamental nature of the traits that it could enhance;[101] the magnitude of its effects;[102] their multiplicity;[103] the resulting ability to gain advantages in multiple spheres of social activity;[104] and the possibility—created by germ line enhancement—that these advantages would be passed on to successive generations.[105]

These characteristics not only give rise to social inequality; more insidiously, they undermine the belief in equality of opportunity. A widespread belief in equality of opportunity is the method by which liberal democracies accommodate the reality of capitalist inequality—that everyone is not equally endowed with equally beneficial natural assets or blessed with the same luck. Sociologists point out that "[w]hereas most Americans are

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98. This truism about American democratic government was recognized as far back as 2 ALEXIS DE TOCQUEVILLE'S DEMOCRACY IN AMERICA 94-105 (Henry Reeve trans., Alfred A. Knopf ed., 1994). Although some political scientists, focusing narrowly on formal equality as reflected in the principle of "one person, one vote," appear at first to discount the need for a minimum degree of social equality, they typically consider social equality to be one prerequisite for political equality. For a general discussion, see Jeffrey Riedinger, *Property Rights and Democracy: Philosophical and Economic Considerations*, 22 CAP. U. L. REV. 893, 895-97 (1993) (examining the relationship between property rights and participatory democracy).

99. *See* FRANK PARKIN, CLASS INEQUALITY AND POLITICAL ORDER: SOCIAL STRATIFICATION IN CAPITALIST AND COMMUNIST SOCIETIES 48 (1971).

100. *See supra* text accompanying notes 66-69 for discussion of point 1.

101. *See supra* text accompanying note 70 for discussion of point 2.

102. *See supra* text accompanying notes 71-74 for discussion of point 3.

103. *See supra* text accompanying notes 75-76 for discussion of point 4.

104. *See supra* text accompanying notes 77-78 for discussion of point 5.

105. *See supra* text accompanying note 79 for discussion of point 6.

willing to tolerate sizeable inequalities in the distribution of resources, they typically insist that individuals from all backgrounds should have an equal opportunity to secure these resources."[106] John Schaar notes that the belief in equal opportunity is instrumental in maintaining the prevailing social order, stating that "[n]o policy formula is better designed to fortify the dominant institutions, values, and ends of the American social order than the formula of equality of opportunity, for it offers *everyone* a fair and equal chance to find a place within that order.[107]

Assuming, as discussed earlier, that the price of genetic enhancements prohibits people of ordinary means from acquiring them, genetic enhancement would create profound differences in ability that would endow the wealthy with opportunities utterly and irrevocably beyond the reach of the majority of the citizens. World history is filled with examples of societies similar to those that would result from wealth-based genetic enhancement. In medieval Europe, for example, individuals were born with a social status, and barring the infrequent case in which peasants were able to obtain education in religious institutions or became apprenticed and eventually esquired to knights, individuals remained members of the class into which they were born.[108] Similarly, in slave-owning societies, people were born into bondage and could be freed only by escape (self-exile) or at the pleasure of their masters.[109] The most obvious surviving example of such a society is the caste system in India. The caste system remains a constant threat

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106. David B. Grusky & Azumi Ann Takata, *Social Stratification*, *in* ENCYCLOPEDIA OF SOCIOLOGY 1965 (Edgar F. Borgatta & Marie L. Borgatta eds., 1992). According to a 1989 study by the National Opinion Research Center, in 1989, 66% of those questioned believed that hard work was more essential for getting ahead, compared to 14% who believed that lucky breaks or help from other people are important, evidencing a strong belief in opportunity for anyone who works hard. *See* AN AMERICAN PROFILE—OPINIONS AND BEHAVIOR, 1972-1989, at 319 (Floris W. Wood ed., 1990).

107. *See* JOHN H. SCHAAR, LEGITIMACY IN THE MODERN STATE 195 (1981). *But see* RUDOLF DREIKURS, M.D., SOCIAL EQUALITY: THE CHALLENGE OF TODAY 186-87 (1971) (stating that "opportunities have always varied with family background" and that "[i]t is obvious that children of the same family do not have the same opportunities, for various reasons inherent in the dynamics within the family group"); Stanley Aronowitz, *Between Nationality and Class*, 67 HARV. EDUC. REV. 188 (1997) (discussing the decline in availability of liberal arts training in the United States and the resulting decline in working class mobility); William Darity, Jr. et al., *Racial and Ethnic Inequality in the United States: A Secular Perspective*, 87 AM. ECON. REV. 301 (1997) (concluding that "there is a long and sustained history of a racially differentiated structure of opportunity in the United States").

108. *See* AN INTRODUCTION TO WESTERN CIVILIZATION 217 (George A. Hedger ed., 1949) (describing the static nature of the medieval class system).

109. *See* KENNETH M. STAMPP, THE PECULIAR INSTITUTION: SLAVERY IN THE ANTE-BELLUM SOUTH 92-97, 109-24 (1956) (discussing the efforts of slaves in the American South to attain their freedom).

to that nation's democratic institutions.[110]

Genetic social stratification thus would undermine our current social system, but it is not certain how seriously.[111] Perhaps society will adapt to

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110. *See* ARTHUR BONNER ET AL., DEMOCRACY IN INDIA: A HOLLOW SHELL (1994) (explaining that the social structure of India maintains caste boundaries despite political change).

111. The fact that so much of the discussion of the nature and impact of genetic enhancement is so speculative may cause objection, and provoke the response that there is no reason to assume that genetic manipulation will have dramatic destructive effects on equality. For all we know, genetic enhancement may not be prohibitively expensive; a partially genetically enhanced middle class may arise between the genobility and the genetic underclass. This group might form a sufficient buffer to enable democratic institutions to survive. Aristotle stated that "cities capable of being well governed are those sorts where the middle is large," and that "[d]emocracies are also more stable and longer lasting than oligarchies because of those in the middle, for the middle are more numerous in democracies than in oligarchies and have a greater share of honors." THE POLITICS OF ARISTOTLE paras. 1295b34, 1296a7 (Peter L. Phillips Simpson trans., University of North Carolina Press 1997). However, the growth of fascism in Italy and Nazi Germany prior to World War II shows that:

> [T]he commercial middle classes in and of themselves, even as a majority class, do not guarantee the rise of democracy or its maintenance. Structural conditions, such as the presence of a powerful feudal aristocracy and a functioning kingly bureaucratic state, can become important inhibitors to the democratic elective affinities carried by the middle class. Historically, circumstances of a crisis nature can turn the middle class away from democracy and toward some form of "nativist," conservative despotism, or towards a modernist form of despotism. Once such a despotism has been created, the middle class may not be powerful enough to overthrow it. It took WWII and the American victory, after all, to overthrow fascism and Nazism in Italy and Germany.

RONALD M. GLASSMAN, 10 THE MIDDLE CLASS AND DEMOCRACY IN SOCIO-HISTORICAL PERSPECTIVE 216 (1995). Another objection to the concerns expressed in this paper might be that the impact of genetic enhancement is bound to occur over a sufficiently long period that democracy will have time to adjust. Or, as conceded earlier, genetic enhancement may not live up to its promise to deliver significant advantages. Yet the impact of genetic enhancement on democratic institutions need not result from its actual effects; it may be sufficient that people *believe* that it confers extraordinary benefits that are confined largely to the rich. For the truly pernicious aspect of inequality—its association with envy and resentment—derives in large part not from people's actual states but from their perceptions of where they stand in comparison with those who are better off. *See* RAWLS, *supra* note 70, at 534-41. The relationship of envy and inequality has been noted by Freud, *see* GROUP PSYCHOLOGY AND THE ANALYSIS OF ENVY 51f (1959), *cited by* RAWLS, *supra* note 70, at 539 n.11; Helmut Schoeck, ENVY: A THEORY OF SOCIAL BEHAVIOR (1969) (cited by RAWLS, *supra* note 70, at 538 n.9), and Nozick, among others. Nozick states: "It is plausible to connect equality with self-esteem. The envious person, if he cannot (also) possess a thing (talent, and so on) that someone else has, prefers that the other person not have it either." NOZICK, *supra* note 78, at 239 (citations omitted). Dworkin assesses the success of his theory of equality of resources by means of an "envy test": "No division of resources is an equal division if, once the division is complete, any [person] would prefer someone else's bundle of resources to his own bundle." Dworkin II, *supra* note 70, at 285. Walzer makes the following interesting observation with regard to envy:

> Opponents of the vision [of equality] often claim that the animating passions

the social artifacts of the genetic revolution and the result, while markedly different from present arrangements, will be relatively stable. The genetic underclass might cede power to their genetic superiors in return for enjoying the material benefits made possible by genetic advances. In this scenario, the underclass would accept the division between social strata, and be content with being upwardly mobile only within the confines of their own class. The genobility, in turn, would rule according to enlightened principles of noblesse oblige, taking care to permit sufficient benefits to trickle down to maintain political and social equilibrium. A democracy of sorts might even persist, with the underclass electing representatives who either belonged to the upper class or who were committed to preserving its privileges. In essence, such a system might not look very different from our own, given the extent to which we increasingly elect representatives who are considerably more privileged than their constituents.

This system, however, seems highly unstable. For one thing, the members of the genetic upper class would require great self-control to avoid over-reaching. At minimum, they would need to maintain effective means of monitoring and regulating the behavior of their peers to prevent anti-social excesses of greed. The system also would be vulnerable to demagogues who achieved power by promising to redistribute genetic endowments more evenly. Assuming that the principle of one-person/one-vote persisted, a numerically inferior genetic upper class could be out-voted by the underclass and Congress could become dominated by elected officials pledged to employ the full force of government to rectify genetic imbalances.

The genobility might respond with reprisals in an effort to preserve its privileged status. At one extreme these could range from threats to withhold the fruits of genetic medicine from non-privileged segments of society, to overt interference with the democratic process. At the other, the genetic upper class is liable to amass sufficient wealth and influence to enable it to control the media, which would in turn permit it to affect the outcome of elections in a manner quite out of proportion to its numbers. Efforts by the underclass to preserve its hegemony might prove no more successful than current efforts to reform campaign finance laws in order to dilute the power of special interests.

In the end, we might embark on an era of social chaos as the system

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> of egalitarian politics are envy and resentment, and it's true enough that such passions fester in every subordinate group. . . . But envy and resentment are uncomfortable passions; no one enjoys them; and I think it is accurate to say that egalitarianism is not so much their acting out as it is the conscious attempt to escape the condition that produces them.

WALZER, *supra* note 77, at xiii.

swung in ever-widening arcs between rule by underclass demagogues and by the genetic aristocracy. Eventually, this could degenerate into mob rule and, then, anarchy. To rid itself of its status as the class of the genetically disadvantaged, the mob might even destroy the scientific foundations of the genetic revolution, perhaps by physically dismantling research centers and erasing mapping and sequencing data.

Alternatively, post-genorevolutionary society could devolve into totalitarian rule by a genetic autocracy. The genetic upper class would employ whatever repressive techniques were necessary in order to obtain power and to keep the underclass in check. Advances in genetic science might even enable the genobility to genetically manipulate the underclass in ways that make it more docile.

While it is impossible to predict with certainty what effect wealth-based genetic enhancement will have on society, what is clear is that it creates not only a moral challenge but a political threat. From a moral standpoint, those who obtain enhancement may not have done anything to deserve it. Adults may have obtained the means necessary to purchase enhancement in objectionable or morally irrelevant ways—through exploitation or the brute luck of inheritance. Moreover, it is difficult to argue that children earned their new-found advantages.[112] Yet genetic enhancement poses more than an ethical quandary. Even if the resources necessary to purchase genetic enhancement are earned in a moral sense, wealth-based enhancement is likely to have a severe societal impact. Somatic enhancement alone could dramatically widen the gap between the haves and have-nots, and crippling class warfare would ensue. Germ line enhancement could create, quite literally, a master race. A future as bleak as this is not perhaps inevitable, but it is unquestionably within the realm of possibility. The question then becomes whether there is any practical way to prevent this.

IV. PROMOTING GENETIC EQUALITY

In the face of the serious threats to equality embodied by wealth-based genetic enhancement, how can we preserve or promote equality? One approach would be to "level up." Society could provide every person access to genetic enhancement. This solution, however, would be prohibitively expensive.[113]

For the sake of argument, imagine that the government decided to divert a large portion of the gross national product to a massive enhancement

112. This is patent in the case of more remote generations enhanced through prior germ cell manipulations.

113. *See supra* notes 55-58 and accompanying text (describing cost of providing universal access to genetic enhancement).

entitlement program. What enhancement services would the entitlement program provide?[114] If the objective were to give each person an equal amount of enhancement resources, those who started out with a more favorable distribution of natural assets would still maintain a superior position. If instead we attempted to give everyone an equal or minimum degree of enhancement, or an equal or minimum amount of enhancement-created opportunity, how would we measure equivalence? Would an extra inch of height be equal to an extra ten points of IQ? Some measure of equivalence would be necessary, and given the subjectivity of personal value reflected in the controversy between welfare and resource theories of equality, it is difficult to conceive how an objective ranking of enhancements could be constructed.[115] We cannot solve the problem by giving everyone an equal amount of money and allowing each individual to purchase those enhancements that he or she desires. Unless all enhancements are equally priced, people who desire expensive enhancements would be less advantaged than individuals content with cheaper ones.[116] Moreover, since society will not be able to provide everyone with access to the same enhancements that the wealthy can purchase, the wealthy will always stay ahead of the rest of the population. Obviously, we could solve the problem by giving everyone the maximum amount of enhancements available. Here too, however, the cost would be prohibitive. These same problems would plague any attempt to level the playing field by giving the unenhanced some other countervailing benefit, like money, information or political power.

Since some people begin with a more favorable distribution of natural assets, society may wish to subsidize access to enhancements for the genetically disadvantaged. By benefiting those who were worst off genetically, this would tend to comport with Rawls' difference principle.[117] Yet, this approach would encounter many of the same problems of cost and measuring equivalence already discussed. In addition, allocating enhancements to the genetically disadvantaged would necessitate identifying genetically disadvantaged individuals or groups within the population, and measuring their degree of disadvantage. This would raise serious practical, moral, and political objections. Determining what counts as a genetic disadvantage is

114. This raises the old debate between reason and welfare equality.

115. Dworkin argues that a market in which resources can be traded or "auctioned" is necessary to achieve equality because it is the only way that a "metric" can be established by which to compare the resource demands of different individuals. *See* Dworkin II, *supra* note 70, at 289.

116. Dworkin's answer is that everyone should be given enough to enable them to purchase the quantity of disability insurance that they would buy if they had an equal amount of resources and knew their individual "tastes, ambitions, talents, and attitudes toward risk." Dworkin II, *supra* note 70, at 316-17. But these conditions are impossibly artificial.

117. *See* RAWLS, *supra* note 70, at 75.

similar to trying to identify whether or not someone has a disability—a determination that is controversial,[118] and often seemingly arbitrary.[119] Measuring the extent of a disability is extremely difficult. The State of Oregon encountered this problem when it tried to allocate Medicaid services based in part on how much they alleviated disability.[120] Moreover, even if we

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118. *See, e.g.*, Maxwell Mehlman et al., *When Do Health Care Decisions Discriminate Against Persons with Disabilities?*, 22 J. HEALTH POL., POL'Y & L. 1385, 1386-87 (1997) (describing disability anti-discrimination laws). The anti-discrimination statutes define "disability" as "[a] physical or mental impairment that substantially limits one or more of the major life activities" of an individual. Americans With Disabilities Act, 42 U.S.C. § 12102(2)(A) (1994). "Major Life Activities means functions such as caring for oneself, performing manual tasks, walking, seeing, hearing, speaking, breathing, learning, and working." 29 C.F.R. § 1630.2(I) (1994). The Supreme Court in *Bragdon v. Abbott*, 524 U.S. 624 (1998), recently held that reproduction is a major life activity. This suggests that infertility also will be regarded as a disability, an issue that lower courts currently are divided over. *Compare* Erickson v. Bd. of Governors, 911 F. Supp. 316 (N.D. Ill. 1995) (holding that infertility is covered by the ADA because reproduction is a major life activity), *with* Krauel v. Iowa Methodist Med. Ctr., 95 F.3d 674 (8th Cir. 1996) (holding that infertility is not covered by the ADA because reproduction is not a major life activity). Certainly the current legal conceptions of disability leave out many less severe conditions that disadvantage people. At the same time, some persons with disabilities object to attempts to rectify their condition. *See, e.g.*, HARLAN LANE ET AL., A JOURNEY INTO THE DEAF-WORLD 403 (1996) (discussing how the use of cochlear implants in deaf children will result in ethnocide, "the systematic blocking of a language minority from coming into its own and pursuing its way of life"); Robert A. Crouch, *Letting the Deaf Be Deaf: Reconsidering the Use of Cochlear Implants in Prelingually Deaf Children*, 27 HASTINGS CTR. REP. 14 (July-Aug. 1997) (arguing against the use of cochlear implants in prelingually deaf children so that they may thrive in the Deaf community); Andrew Solomon, *Defiantly Deaf*, N.Y. TIMES, Aug. 28, 1994, § 6 (Magazine), at 4 (quoting Patty Ladd, a British Deaf scholar, who describes cochlear implants as "[t]he Final Solution").

119. Dworkin, for example, complains in response to Rawls' difference principle that "[t]here is a conceded degree of arbitrariness in the choice of any description of the worst-off group, and this is, in any case, a group whose fortunes can be charted only through some mythical average or representative members of that group." Dworkin II, *supra* note 70, at 339.

120. Ultimately, Oregon abandoned its effort after it failed to design a program that comported with laws prohibiting discrimination on the basis of disability. For a description of the problems encountered by the Oregon Medicaid program, see MAXWELL J. MEHLMAN & JEFFREY R. BOTKIN, ACCESS TO THE GENOME: THE CHALLENGE TO EQUALITY 69-73, 86-87 (1998); Alexander Morgan Capron, *Oregon's Disability: Principles or Politics?*, 22 HASTINGS CTR. REP. 18, 18-20 (Nov.-Dec. 1992); David C. Hadorn, M.D., *The Problem of Discrimination in Health Care Priority Setting*, 268 JAMA 1454, 1454-59; Paul T. Menzel, *Oregon's Denial: Disabilities and Quality of Life*, 22 HASTINGS CTR. REP. 21, 21-25 (Nov.-Dec. 1992); *The Oregon Health Care Proposal and the Americans with Disabilities Act*, 106 HARV. L. REV. 1296, 1296-1313 (1993); D. Orentlicher, *Rationing and the Americans with Disabilities Act*, 271 JAMA 308, 308-14 (1994); OREGON HEALTH SERVS. COMM'N, PRIORITIZATION OF HEALTH SERVICES: A REPORT TO THE GOVERNOR AND LEGISLATURE (1993) (on file with author); Health Care Financing Admin., *Special Terms and Conditions Regarding the Oregon Plan*, 9 ISSUES L. & MED. 423, 423-24 (1994); *Oregon Carrying Out New State Health Care Plan: Questions Abound as First Phase Begins in Program to Cover All Residents*, DALLAS MORNING NEWS, Feb. 19, 1994, at A13.

could identify and quantify genetic disadvantage, we would need to establish a "normal" degree of genetic well-being to be obtained by the disadvantaged, so that we could allocate the correct amount of enhancements or money with which to purchase enhancements.[121] "Normalcy," however, is highly arbitrary, value-laden, and subjective.[122] Furthermore, normality will remain in flux as the distribution of advantages and disadvantages within the population shifts, and as the average level of advantage increases in correspondence to the number of enhanced individuals. Finally, any attempt by the government to identify and rectify genetic disadvantage smacks of eugenics. Eugenics is politically suspect, if not unthinkable.[123]

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121. *See* discussion *supra* notes 118-19 (describing subsidizing disadvantaged with genetic enhancements).

122. *See* Whitehouse et al., *supra* note 20, at 16-18 (criticizing Normal Daniels' "normal function" standard of distributive justice for access to mental health and other health care services).

123. Thousands of persons around the world became the victims of eugenics policies during the Twentieth Century. Nazi Germany implemented the most infamous policies, resulting in the murder of two hundred thousand psychiatric patients, nonconformists, and ill camp inmates, all eliminated ostensibly to preserve financial resources. *See* Götz Aly et al., *Medicine Against the Useless*, *in* CLEANSING THE FATHERLAND: NAZI MEDICINE AND RACIAL HYGIENE 23, 23-24 (1987). The National Social Physicians' League, a German organization boasting a membership composed of 6% of German physicians, supported the Nazi government's eugenics policies in arguing "that the useless dissipation of costly medications drawn from the public store cannot be justified." Garland E. Allen, *Science Misapplied: The Eugenics Age Revisited*, CURRENT, Dec. 1, 1996, at 7. German Protestant theologians argued that "God had created such supra-individual entities as the family, nations or races, whose future well-being overrode the rights of individuals. . . ." MICHAEL BURLEIGH, ETHICS AND EXTERMINATION: REFLECTIONS ON NAZI GENOCIDE 131 (1997). This rationale allowed theologians to support sterilization policies, although they did not support euthanasia. *See id.* at 130-52. The following question from a mathematics textbook further illustrates how embedded eugenics was in Nazi German society: "If the construction of an insane asylum requires 6 million RM, how many housing units for normal families could be built at 15,000 RM apiece for the amount spent on insane asylums?" Allen, *supra*, at 7. While many of the persons eliminated or sterilized were disabled in some manner, the Nuremberg laws made the racial overtones of Nazi eugenics policies explicit by preventing Jews from marrying Germans and expelling Jews from public life. *See* STEFAN KÜHL, THE NAZI CONNECTION: EUGENICS, AMERICAN RACISM, AND GERMAN NATIONAL SOCIALISM 97-98 (1994).

Nazi Germany was not alone in implementing eugenics policies. From the beginning of their efforts, Nazi eugenicists maintained a close relationship with their counterparts in the United States. *See id.* A pamphlet created by the California-based Human Betterment Foundation and sent to German racial hygienists and Nazi administrators maintained "that sterilization served to protect the sterilized person, his or her family, and society at large." *Id.* Nazi Germany was encouraged by the success of the eugenics movement in California, and pointed to California's experience and to U.S. Supreme Court decisions to justify its own eugenics program. *See id.* at 43, 101. The U.S. Supreme Court upheld Virginia's compulsory sterilization law in *Buck v. Bell*, 274 U.S. 200 (1927), with Justice Holmes's majority opinion stating that "[t]hree generations of imbeciles are enough." *Id.* at 207. It was not until the racial basis

If leveling up is not a feasible response to genetic enhancement, the

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of Nazi eugenics became evident that American eugenicists began to distance themselves from their German colleagues. *See* KÜHL, *supra*, at 97-104. Approximately 60,000 Americans were forcibly sterilized in 34 states during the 1930s. *See Nordic Eugenics. Here, of All Places*, ECONOMIST, Aug. 30, 1997, at 36 [hereinafter *Nordic Eugenics*].

More recently, China passed the Maternal and Infantile Health Law in 1995, pressuring persons with a family history of genetic problems to undergo genetic testing, and compelling family doctors to recommend an abortion if the fetus had a particular genetic condition. These policies became particularly worrisome when Genset S.A., a French genetic research company, came to an agreement with the Chinese government that would allow Genset to do DNA profiles of the entire Chinese population. *See* Mike Pezzella, *Landmark Deal Between China and French Firm Raises Eugenics Fears*, BIOTECHNOLOGY NEWSWATCH, Dec. 2, 1996, at 14. Additionally, a 1988 law in China bans marriages by mentally disabled persons unless they are sterilized. *See* Jody W. Zylke, *Examining Life's (Genomic) Code Means Reexamining Society's Long-Held Codes*, 267 JAMA 1715, 1715 (1992).

Revelations of Sweden's eugenics program shocked the international community. Sweden began sterilizing "social undesirables" in 1935, and the National Institute for Racial Hygiene, charged with administering the program, existed until 1976. *See* James Walsh et al., *Unnatural Selection: A Startling Revelation of Sweden's Eugenics Program Exposes Similar Medical Engineering Around Europe*, TIME INT'L, Sept. 22, 1997, at 66. During this period, approximately 62,000 Swedes were sterilized for various reasons, ranging from having a severe mental handicap to having poor sight. *62,000 Swedes Sterilized Against Their Will*, SCANDINAVIAN PRESS, Oct. 31, 1997, at 13. At age 17, Maria Nordon was given the choice of remaining in a school for "intellectually subnormal elements" or being sterilized and entering normal society. Faced with these two undesirable alternatives, Maria chose sterilization. The learning disability that put her in the special school was caused by her poor eyesight and lack of spectacles, unknown to the headmistress who offered her the choice. *See* Walsh et al., *supra*, at 66. Perhaps surprisingly, Sweden's eugenics program was propagated by the Social Democrats, with their emphasis on social welfare and efficiency. By sterilizing the mentally disabled, Sweden could support its welfare state by reducing health care and schooling costs for the disabled. *See* Gunnar Broberg & Mattias Tydén, *Eugenics in Sweden: Efficient Care*, *in* EUGENICS AND THE WELFARE STATE: STERILIZATION POLICY IN DENMARK, SWEDEN, NORWAY, AND FINLAND 135 (Gunnar Broberg & Nils Roll-Hansen eds., 1996).

Similarly, Norway, Finland, Denmark, and Canada also employed eugenics in the name of efficiency. *See id.* In Alberta, Canada, approximately 2,800 people were sterilized between 1928 and 1972 to prevent mentally defective persons from having children. The victims of the policy included "Indian girls as young as 14, already-infertile Downs Syndrome boys, children with cerebral palsy, illiterate immigrants from Eastern Europe and delinquent youths from bad homes. . . ." *Canada. Sterilized in Alberta*, ECONOMIST, Nov. 9, 1996, at 46. Approximately 11,000 individuals were sterilized in Denmark, while Norway and Finland each acknowledge sterilizing 1,000 women under their eugenics programs. *See Nordic Eugenics*, *supra*, at 36.

Eugenics policies in these countries were usually justified based on their promotion of efficiency: "[D]ysgenic groups were not only a threat to the quality of the race, they were a heavy burden on society." Frank Dikötter, *Race Culture: Recent Perspectives on the History of Eugenics*, 104 AM. HIST. REV. 467, 469 (1998). Race was a factor in many of the programs described above, however, as was most evident in Nazi German policies. "Information about human genetics can be used to stigmatize . . . virtually anyone deemed economically costly or socially undesirable." *Id.* at 478.

alternative is to level down.[124] The most straightforward approach would be to prevent anyone from obtaining genetic enhancement. A ban on genetic enhancements could be aimed at a variety of targets. Similar to laws that punish illegal drug use, or rules that prohibit the use of performance-enhancing drugs in sports, purchasing or possessing enhancements could be illegal.[125] Health care professionals and institutional providers, such as hospitals and IVF clinics, could also be targets of the law. Legislators could make it a crime for health care professionals to provide genetic enhancements.[126] Violators could face disciplinary actions by state medical boards, including loss or suspension of their licenses.[127] Hospitals and other facili-

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124. The potential role of leveling down as a remedy for general inequality is well-recognized. Rawls' difference principle itself, by which a benefit for the better-off is only just if it also benefits the least well-off, has been characterized as "a constraint imposed on talented men and women. . . ." WALZER, *supra* note 77, at 15. Others acknowledge that, in order to reduce inequality, it may be necessary to transfer resources or welfare from the better off to the worse off. For example, Rakowski proposes "equality of fortune" as the cure for inequality, according to which "[r]esources should be taken from those whose complement of powers is above average and given to those whose abilities fall short," although he adds that this approach is valid "so long as restoring equality does not place inordinate strain on the more fortunate. . . ." RAKOWSKI, *supra* note 92, at 138. Rosenfeld views leveling down as necessary in some cases to promote equality of opportunity. He gives the example of an apple orchard open for public harvesting once a year on a first-come, first-served basis in a society in which not everyone has a car. To ensure equality of opportunity, it may be necessary for people who drive to the orchard to be denied admission: "[E]nsuring an opportunity may. . . require that certain competitors be deprived of some of the means at their disposal." Rosenfeld, *supra* note 92, at 1692.

125. Making simple possession illegal would have the curious result that children whose parents enhanced them without their consent would be in violation of the law. A ban not reaching these children would be fatally incomplete.

126. Similar laws have been proposed for attempts to clone humans, including laws outlawing the use of somatic cells in the production of human clones, *see, e.g.*, H.R. 923, 105th Cong. (1997), S. 1599, 105th Cong. (1997), S. 1601, 105th Cong. (1997); laws prohibiting the cloning of humans, *see, e.g.*, S. 1574, 105th Cong. (1998); S.B. 90-1243, Reg. Sess. (Ill. 1997), H.B. 122-675, Reg. Sess. (Ohio 1997), S.B. 8, Reg. Sess. (Ala. 1998), S.B. 68, Reg. Sess. (Ala. 1998), S.B. 1344, Reg. Sess. (Cal. 1997), S.B. 122-218, Reg. Sess. (Ohio 1997), A.B. 221-9116, Reg. Sess. (N.Y. 1997), S.B. 221-5993, Reg. Sess. (N.Y. 1997); laws prohibiting attempts to clone through somatic cell nuclear transfer and the use of Federal funds for such purpose, *see, e.g.*, S. 1602, 105th Cong. (1998), H.B. 90-2235, Reg. Sess. (Ill. 1997), A.B. 221-9183, Reg. Sess. (N.Y. 1997); and laws banning research using cloned cells or tissues, *see, e.g.*, H.B. 1237, Reg. Sess. (Fla. 1997), A.B. 1251, Reg. Sess. (Cal. 1997).

127. Violators could also face ethical sanctions by professional societies. The American Medical Association, for example, has declared that it is unethical for physicians to provide genetic enhancement to anyone unless they can provide "equal access . . . irrespective of income or other socioeconomic characteristics." AMA Council on Judicial and Ethical Affairs, *Ethical Issues Related to Prenatal Genetic Testing*, 3 ARCHIVES FAM. MED. 633, 641 (1994). The AMA also condemns genetic enhancement that does not provide "clear and meaningful benefit to the fetus or child" or that causes a "trade-off with other characteristics or traits." *Id.* at

ties like IVF clinics that offer enhancement services could lose their licenses, their accreditation, or their ability to receive reimbursements under Medicare and Medicaid.[128] Finally, if genetic enhancements were proprietary products like drugs or medical devices, the Food and Drug Administration could deny marketing approval.[129]

Why wait until enhancements are developed and then ban their use? Why not prohibit research aimed at developing enhancement technologies in the first place? The federal government has already banned federal funding of research on embryos and fetuses.[130] Privately-funded research

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128. The federal government has hinged Medicare and Medicaid reimbursement on compliance with a number of regulatory measures, such as the Emergency Medical Treatment and Active Labor Act, 42 U.S.C. § 1395dd (1994) (prohibiting "patient dumping," or the practice of transferring indigent emergency room patients to other hospitals).

129. The FDA has asserted jurisdiction over licensing of enhancement products such as tanning agents and wrinkle creams. *See* United States v. Article Consisting of 36 Boxes, Etc., 284 F. Supp. 107 (D. Del. 1968), *aff'd on other grounds*, 415 F.2d 369 (3d Cir. 1969) (wrinkle creams as drugs); 43 Fed. Reg. 38,206 (1978) (tanning agents as drugs). In addition, the FDA asserts jurisdiction over drugs and devices produced through genetic engineering, and has published regulatory guidelines for industry. *See* U.S. Dep't of Health and Human Services, *Guidance for Industry*, (last modified Mar. 1998) <http://www.fda.gov/cber/gdlns/somegene.txt>. Another potential government drug regulator is the Drug Enforcement Administration; after all, the Controlled Substances Act which it enforces is the primary legal scheme devoted to the prohibition of socially undesirable drug use. *See* Controlled Substances Act, 21 U.S.C. § 811 (1997) (authorizing the Attorney General to classify and regulate controlled substances). Under section 812, substances are scheduled as follows: Schedule I: high potential for abuse, no currently accepted medical use, lack of accepted safety for use under medical supervision; Schedule II: high potential for abuse, has a currently accepted medical use, abuse may lead to severe psychological or physical dependence; Schedule III: less potential for abuse than Schedule I and II substances, has a currently accepted medical use, abuse may lead to moderate or low physical or high psychological dependence; Schedule IV: low potential for abuse compared to Schedule III substances, has a currently accepted medical use, abuse may lead to limited physical or psychological dependence compared to Schedule III; Schedule V: low potential for abuse compared to Schedule IV, has a currently accepted medical use, may lead to limited physical or psychological dependence compared to Schedule IV. *Id.* § 812 (b)(1)(5).

While products such as drugs and devices might be proprietary, processes used in genetic enhancement, such as DNA testing and manipulation, might be patented and licensed. It is unclear if the FDA has jurisdiction over this type of activity. For a further discussion, see Maxwell Mehlman, *How Will We Regulate Genetic Enhancement?* 34 WAKE FOREST L. REV. 671, 699-703 (1999).

Health insurers and other third party payers such as employers and government entitlement programs are not suitable targets for enhancement regulation since they are not likely to pay for enhancement services. *See supra* notes 50-54 and accompanying text.

130. The first ban relating to research using fetuses accompanied the establishment of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. *See* 42 U.S.C. § 289g (1999) (prohibiting research "on a living human fetus" that is not done "for the purpose of assuring the survival of such fetus"). The recommendations of

could be restricted by penalizing health care institutions that participated in clinical trials,[131] and by urging the FDA to deny permission to transport experimental enhancement products across state lines for human testing.[132]

Yet these restrictive approaches have limitations.[133] Penalizing people who genetically enhanced their children would trigger intense constitu-

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the National Commission were codified in 45 C.F.R. 46 (1998). The provisions of 45 C.F.R. § 46.208 govern activities directed toward fetuses *in utero*, while 45 C.F.R. § 46.209 governs activities directed toward fetuses *ex utero*. Both are geared towards allowing only research posing a minimal risk to the fetus. Additionally, 45 C.F.R. § 46.204 provides for the establishment of Ethical Advisory Boards responsible for evaluating the merit of individual research proposals that fall outside of 45 C.F.R. § 46. The creation of the President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research drained resources from the Ethical Advisory Board, however, thus creating a *de facto* "moratorium on fetal research posing more than minimal risk, unless expected to enhance the health of the particular fetus." Robert Mullan Cook-Deegan, *Cloning Human Beings: Do Research Moratoria Work?*, *in* 2 CLONING HUMAN BEINGS: REPORT AND RECOMMENDATIONS OF THE NATIONAL BIOETHICS ADVISORY COMMISSION H1, H8 (1997). In 1985, Congress amended the Public Health Service Act banning funding for "any research or experimentation . . . on a viable living human fetus ex utero or a living human fetus ex utero for whom viability has not been ascertained" unless the research was geared towards increasing the survival prospects of the particular fetus or the research would not subject the fetus to increased risk of harm. The 1988 NIH authorization continued this moratorium. *See* Cook-Deegan, *supra* at H8. Funding for experiments using fetal tissue became a concern soon after. Assistant Secretary of Health Robert Windom responded to an NIH request for authorization to support research into using fetal tissue to treat Parkinson's disease by imposing a funding moratorium pending consideration by an *ad hoc* panel of his questions. *See* Letter from Robert Windom to Dr. Wyngaarden, *reprinted in Report of the Human Fetal Tissue Transplantation Research Panel*, 1988 NAT'L INST. ON HEALTH B1-B3. In 1993, the National Institutes of Health Revitalization Act of 1993 removed the legislative moratorium on fetal research that was in place since 1985. Pub. L. No. 103-43, 107 Stat. 122 (1993). This moratorium was restored in the NIH appropriations bills for fiscal years 1996 through 1998. Departments of Labor, Health and Human Services, Education, and Related Appropriations Act, Pub. L. No. 105-78, 111 Stat. 1416, 1517. For a discussion of these moratoria, see generally Cook-Deegan, *supra*.

131. For example, the federal government requires hospitals and other provider institutions that conduct non-federally funded experiments to conform to guidelines for protecting human subjects, at risk of being disqualified from receiving federal research funds for other projects. *See* 45 C.F.R. § 46.102-103 (1998); Jesse A. Goldner, *An Overview of Legal Controls on Human Experimentation and the Regulatory Implications of Taking Professor Katz Seriously*, 38 ST. LOUIS U. L.J. 63, 99 (1993) (explaining that federal regulations for research have been made applicable to all institutions doing research, including hospitals, universities, and medical schools, regardless of the source of funding).

132. The FDA would deny the sponsors of such trials an approved IND (in the case of a drug) or IDE (in the case of a medical device). For a discussion of the FDA's involvement in human experimentation, see Richard A. Merrill, *The Architecture of Government Regulation of Medical Products*, 82 VA. L. REV. 1753, 1777-82, 1821 (1996).

133. For a more complete discussion of the gaps and weaknesses in government regulation of genetic enhancements, see Maxwell Mehlman, *How Will We Regulate Genetic Enhancement?*, 34 WAKE FOREST L. REV. 671 (1999).

tional debate. Particularly in the case of passive enhancements involving traditional "coital" methods of reproduction, the Supreme Court is likely to apply a strict scrutiny standard under which the right to decide what type of child to conceive or bring to term can be overridden only by a compelling state interest, and then only if the state uses the least intrusive means of regulation.[134] Genetic enhancement accompanying less traditional methods

134. The extent of procreative rights entitled to constitutional protection is unclear. The existing cases can be divided among those involving coital reproduction, those involving noncoital assisted reproduction, and those involving surrogacy. To date, most of the cases have dealt with coital reproduction. Coital reproduction cases can be further divided into those that tend to uphold the right to procreate and those that tend to uphold the right not to procreate. In *Skinner v. Oklahoma*, 316 U.S. 535 (1942), the Supreme Court invalidated Oklahoma's Habitual Criminal Sterilization Act as a violation of the Equal Protection Clause of the Fourteenth Amendment. In broad dicta, the Court stated that "[w]e are dealing here with legislation which involves one of the basic civil rights of man. Marriage and procreation are fundamental to the very existence and survival of the race." *Id.* at 541. Based on this dictum, "it seems indisputable that even a conservative Supreme Court would find that married couples have a fundamental constitutional right to reproduce by coitus." John A. Robertson, *Embryos, Families and Procreative Liberty: The Legal Structure of the New Reproduction*, 59 S. CAL. L. REV. 939, 959 (1986). Some commentators disagree with this analysis, arguing that "Skinner is too weak a reed to carry so much constitutional weight." Radhika Rao, *Constitutional Misconceptions*, 93 MICH. L. REV. 1473, 1484-85 (1995). Even if married individuals were found to have a right to coital reproduction, the same cannot necessarily be said of single individuals because "the Supreme Court has not yet held that fornication and marriage laws violate an unmarried person's right to privacy." Robertson, *supra*, at 964.

The Court's decisions concerning birth control and abortion seem to uphold the right not to procreate. In *Griswold v. Connecticut*, 381 U.S. 479 (1965), the Court held that Connecticut could not prohibit the use of contraceptives by married persons, stating that the right of privacy protected the decision by married couples whether or not to have children. The Court extended this privacy right and applied it to individuals, whether married or single, in *Eisenstadt v. Baird*, 405 U.S. 438 (1972), striking down a law preventing the use of contraceptives by unmarried individuals. In *Roe v. Wade*, 410 U.S. 113 (1973), the Court applied the right of privacy to a woman's decision to procure an abortion, holding a law prohibiting abortion to be unconstitutional. The Court reaffirmed this right in *Planned Parenthood v. Casey*, 505 U.S. 833 (1992). A plurality of the Court took an expansive view of procreative liberty, stating that "personal decisions relating to marriage, procreation, contraception, family relationships, childrearing, and education" are "central to the liberty protected by the Fourteenth Amendment." *Id.* at 851. The Court did give greater weight to the State's interest in protecting the fetus than under *Roe*, however.

Few cases deal with noncoital reproduction. In *Goodwin v. Turner*, 908 F.2d 1395 (8th Cir. 1990), the Court of Appeals held that the Bureau of Prison's prohibition of artificial insemination of wives by male prison inmates was "reasonably related to furthering the legitimate penological interest of treating all inmates equally." *Id.* at 1400. It is unlikely, however, that this decision will have an impact outside the prison context. *See* NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 138. In a much broader decision, *Lifchez v. Hartigan*, 735 F. Supp. 1361 (N.D. Ill. 1990), the District Court granted the plaintiff-physician's motion for summary judgment, holding unconstitutionally vague Illinois' abortion law prohibiting the sale of and experimentation with a fetus produced by fertilization of a human ovum by a hu-

of reproduction, IVF for example, may be entitled to less constitutional protection, but even then, the courts are likely to take a hard look at overly intrusive governmental regulation. Somatic self-enhancement, while not raising issues of reproductive freedom, would set the state's interest in promoting equality against the individual's constitutionally protected interest in personal liberty and autonomy, including the right to make life-style decisions that do not harm others.

Consumers may decide to purchase enhancement drug products, biologics, or devices marketed for therapeutic reasons, yet employ the products

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man sperm unless the experimentation was therapeutic. The court also found the law unconstitutional because it was an impermissible restriction on "a woman's fundamental right of privacy, in particular, her right to make reproductive choices free of governmental interference with those choices." *Id.* at 1376.

In addition, surrogacy and donorship has not been addressed frequently by the judicial system. In *In re Baby M.*, 537 A.2d 1227 (N.J. 1988), the New Jersey Supreme Court stated that a father's procreative right did not mandate enforcement of the surrogacy contract when a surrogate mother changed her mind. The court reasoned that doing so "would be to assert that the constitutional right of procreation includes within it a constitutionally protected contractual right to destroy someone else's right of procreation." *Id.* at 1254. In a California surrogacy case, *Johnson v. Calvert*, 851 P.2d 776 (Cal. 1993), the surrogate mother refused to relinquish the child to whom she gave birth pursuant to the surrogacy agreement. The court rejected the argument that the biological mother had a constitutional right to the child, stating that "[s]ociety has not traditionally protected the right of a woman who gestates and delivers a baby pursuant to an agreement with a couple who supply the zygote from which the baby develops and who intend to raise the child as their own." *Id.* at 786.

Some commentators argue that the recognition of the right to coital reproduction necessarily implies a right to noncoital reproduction, arguing that "[t]he couple's interest in reproducing is the same, no matter how conception occurs, for the values and interests underlying coital reproduction are equally present." Robertson, *supra*, at 960. The constitutional protection of coital reproduction is based on many factors, however, including:

1. The importance of bodily integrity.
2. The intimacy of the marital relationship and the integrity of the family unit.
3. The relationship between coital reproduction and sexual intimacy.
4. The importance of being a parent and raising a child.
5. The importance of carrying on a genetic line.
6. The religious dimensions of decisions about procreation and child rearing.
7. The woman's interest in carrying a developing fetus and giving birth.
8. The intrusiveness of attempts to enforce laws limiting decisions about procreation.
9. The danger that placing control of reproduction in the hands of the state will lead to eugenic policies.

NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 144-45. Thus, it seems reasonable to conclude that, as a form of reproduction implicates more of these concerns, it becomes more significant as a constitutional right. If noncoital reproduction does not implicate these concerns, it may not occupy a position similar to that accorded to coital reproduction in the constitutional scheme. Noncoital reproduction by married couples would implicate many of these factors, while assisted reproduction by unmarried persons would not implicate marital privacy. *See id.* at 145. Entering the realm of donorship and surrogacy departs further from these values, and introduces the competing interests of the surrogate. *See id.* at 146.

for unapproved or "off-label" enhancement purposes. Consequently, while FDA restrictions on sales of these products may survive constitutional challenge as an appropriate regulation of interstate commerce, they would be hampered by the way in which these products are likely to become commercially available. A genetically-engineered drug that enhanced cognition, for example, may be approved to treat cognitive impairment, such as the effects of Alzheimer's disease.[135] Upon approval for a therapeutic purpose, however, people would request it for unapproved enhancement purposes. The experience with human growth hormone, mentioned earlier, is a prime example.[136] This genetically-engineered drug has been approved for short children with "a lack of adequate endogenous growth hormone secretion."[137] Yet reports suggest that parents also request doctors to prescribe it for children who are merely short, and there are anecdotal accounts of parents requesting the drug for children who are already tall, in order to increase their prospects of playing competitive basketball.[138]

The FDA does not effectively regulate off-label uses of unapproved drugs; it merely limits the ways in which the manufacture may promote the drug for unapproved uses.[139] Even if the FDA attempted to completely prohibit manufacturers from promoting drugs for an unapproved use,[140] the public would learn about enhancement uses through media reports, the internet, and word-of-mouth.[141] Targeting health professionals who pro-

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135. *See* Whitehouse et al., *supra* note 20, at 14-16.

136. *See supra* note 8 and accompanying text (discussing human growth hormone).

137. PHYSICIAN'S DESK REFERENCE 993 (52d ed. 1998).

138. *See* Rita Rubin, *Giving Growth a Synthetic Hand: Use of Hormone Sparks Debate*, DALLAS MORNING NEWS, July 7, 1986, at A1.

139. The only FDA restrictions on off-label use limit its promotion by manufacturers. *See* David A. Kessler, *Regulating the Prescribing of Human Drugs for Nonapproved Uses Under the Food, Drug, and Cosmetic Act*, 15 HARV. J. ON LEGIS. 693 (1978). However, Congress recently authorized the agency to permit manufacturers to disseminate reports of studies on unapproved uses so long as the manufacturer is actively engaged in obtaining marketing approval for the unapproved indication. 21 U.S.C.A. § 360aaa to 360aaa-6 (West Supp. 1998).

140. *But see* Washington Legal Found. v. Friedman, 13 F. Supp. 2d 51 (D.D.C. 1998) (ruling that FDA regulation of off-label uses "represented an impermissible restriction on commercial free speech").

141. *See, e.g.*, Alex Kuczynski, *Getting a Fix on Youth?*, SUN-SENTINEL (Ft. Lauderdale, Fla.), Apr. 26, 1998, at 1E; Glen MacNow, *NFL Drug Game Gets More Serious*, SEATTLE TIMES, Dec. 22, 1991, at C1; Susan V. Seligson, *Anti-Aging Comes of Age: Maverick Doctors at Nevada's New Cenegenics Clinic Say You Should Buy into Their Program If You Want to Stay Young in Mind and Body*, HEALTH, Apr. 1, 1998, at 62; *Doctor Lichten's 5 Step Program to Living Longer and Better* (visited Feb. 12, 1997) ; *Human Growth Hormone: You Can Grow Young Again* (visited June 1, 1998) <http://www.healnet.com/grodo/HGH>. An Illinois study found that, of the teenage steroid users in the state, twenty-one percent said a teacher or coach suggested they use anabolic steroids. Seventy-two percent obtained steroids from non-medical sources, with fourteen percent obtaining the steroids from a teacher or coach. *See Athletes Are Not Alone in Steroid Use*,

vided enhancement products to their patients would present similar obstacles. The FDA presently has no authority to control the prescribing behavior of physicians. Consequently, they are free to prescribe products for unauthorized uses.[142] There is nothing unlawful about a physician prescribing human growth hormone to enhance children, a purpose that is not indicated on the product label. Currently, the only effective action the agency can take is to ban or limit sales of the product—for both therapeutic and enhancement purposes.[143] Yet in the case of products approved to treat serious and especially popularized diseases,[144] this would carry an intolerably high political price.

L.A. TIMES, Mar. 19, 1992, at E3.

142. *See* 21 U.S.C.A. § 396 (West Supp. 1998) (stating that nothing in Chapter 21 is intended to interfere with a health care practitioner's authority "to prescribe or administer any legally marketed device to a patient for any condition or disease within a legitimate health care practitioner-patient relationship"); *see also* Legal Status of Approved Labeling for Prescription Drugs: Prescribing for Uses Unapproved by the Food and Drug Administration, 37 Fed. Reg. 16503 (1972) (to be codified at 21 C.F.R. pt. 130) (proposed Aug. 15, 1972) (stating that a physician is not required to gain FDA approval "in order to lawfully prescribe [a] drug for an unapproved use").

143. The FDA has overseen the withdrawal of drugs when they have turned out to be unsafe after they have been approved. The diet drugs Pondimin (fenfluramine) and Redux (dexfenfluramine) were withdrawn after reports emerged that the drugs were related to heart valve abnormalities. *See FDA Yanks Two Diet Drugs Used in Popular Fat-Busting Pill Combos*, BIOTECHNOLOGY NEWSWATCH, Oct. 6, 1997, at 8; *see also* Thomas J. Moore et al., *Time to Act on Drug Safety*, 279 JAMA 1571 (1998) (discussing safety monitoring after marketing of drugs). The painkiller Duract was withdrawn after being connected with cases of serious liver failure. Posicor, a drug used for treating high blood pressure, was withdrawn because of its possible lethalness when used in combination with other drugs. *See* Sheryl Gay Stolberg, *New Painkiller Is Withdrawn After Four Deaths*, N.Y. TIMES, June 23, 1998, at A1. Such withdrawals of approved drugs are rare, with only six in the last decade, but pressure to speed up the approval process may cause more unsafe drugs to be approved. *See id.* The agency also has restricted the use of some products to physicians with specialized training. Treatment using the Contigen Bard Collagen Implant, the first injectable treatment for urinary stress incontinence caused by intrinsic sphincter deficiency, can only be provided by "a physician specializing in incontinence who has had urology training in the procedure." Sharon Snider, *FDA Approves New Injectable Product for Incontinence* (last modified Oct. 12, 1993) <http://www.fda.gov./bbs/topics/ANSWERS/ANS00531.html>.

144. Medical researchers complain about the "disease-of-the-month" mentality that swings public concern, and more importantly, public funds, from one disease to the next depending on which ailment has captured the momentary attention of the media. *See* Janny Scott, *Women's New Push for Health, Stepped-Up Activism Nationwide Is Focusing on Breast and Ovarian Cancer. Groups Want Improved Insurance Coverage and More Funds for Research*, L.A. TIMES, Apr. 30, 1991, at A1 (quoting Dr. John Laszlo of the American Cancer Society as stating that "[t]he process of deciding how much we want to do for our health in this country is more haphazard, perhaps, than I would like to see"); *see also* Daniel S. Greenberg, *Special Treatment for Celebrity Afflictions?*, WASH. POST, June 12, 1996, at A21 (discussing the making of "health-research choices on the basis of celebrity status and exaggerated hopes of breakthroughs").

The same problem would beset efforts to prevent research on genetic enhancements. Consider a ban on the research of genetically engineered drugs designed to enhance cognitive function. Reasonable people may believe that this ban would be justified on the ground that developing this product would give those who used them an unfair advantage in competitions for scarce resources like college acceptances or aptitude-based job slots.[145] But these same products could be employed successfully to treat diseases of cognitive deficiency, like Alzheimer's and dementia. It is extremely difficult to curtail research on a specific product use, and in any event, there is little point—once the product is developed for therapeutic use, it can be converted to enhancement uses.

Moreover, an effective ban on access to genetic enhancements, whether aimed at individuals obtaining them for themselves or their children, or at providers and manufacturers, would require an elaborate enforcement scheme. The programs would be similar to ones currently employed to control the use of performance enhancing drugs in sports and the use of illicit recreational drugs. Accordingly, the Drug Enforcement Agency rather than the FDA may be the most appropriate government agency to regulate genetic enhancements. After all, the DEA, pursuant to the Controlled Substances Act, is responsible for enforcing restrictions on access to physiologically active products that society deems objectionable.[146]

Similar to the War on Drugs and the effort to ban drugs in sports, restricting access to genetic enhancements to promote equality is likely to be extremely intrusive and expensive. Moreover, it is likely that a ban will not be completely effective. Enhancement drugs, although perhaps complicated to manufacture, may be easy to conceal. Similar to the way that "back-alley" abortions could be obtained prior to *Roe v. Wade*, even enhancements that depended on sophisticated medical procedures, like IVF, might be procured if one "knew the right person."[147] The overwhelming consumer demand for genetic enhancements is certain to spawn a robust black market.[148] Furthermore, the experience with the abortion controversy indicates

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145. For a fuller discussion of the problems of unfair competition between enhanced and unenhanced individuals, see *infra* notes 172-204 and accompanying text.

146. See *supra* note 129 (describing regulation of controlled substances).

147. It is estimated that, in the early 1960s, one out of every five pregnancies was terminated by abortion, even though the procedure was illegal. In 1962 alone, more than one million abortions were believed to have been performed, one half by physicians. *See* Zad Leavy & Jerome M. Kummer, *Criminal Abortion: Human Hardship and Unyielding Laws*, 35 S. CAL. L. REV. 123 (1962).

148. *See* Mark Zeigler, *Illegal Doping Is Everywhere Now, and the Culprits Are Rarely Caught*, SAN DIEGO UNION-TRIB., Aug. 17, 1997, at C1 (stating that performance enhancing drugs are "seeping through the sports world like an injectable steroid is absorbed into the blood stream," and the only people who are caught are either "poor or stupid"). Performance en-

that people who are prevented from obtaining genetic enhancements domestically may procure them abroad.[149]

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hancing drugs are available through a variety of sources. European factories openly manufacture them, Tijuana pharmacies sell them over-the-counter, and web sites are dedicated to providing advice on how to manufacture, obtain, and use them. *See id.* Another example is the black market in drugs to treat AIDS that have not been approved in the United States. Patients have even formed "buyers clubs" to facilitate access to these products. *See* Jon S. Batterman, *Brother Can You Spare a Drug?*, 19 HOFSTRA L. REV. 191, 207-08 (1990) (describing underground networks whereby unapproved drugs are funneled into the United States). More recently, states are reported to be concerned that adding the anti-impotence drug Viagra to the list of drugs approved for reimbursement under Medicaid would cause supplies to be diverted to "street use." *See* Kris Mayes, *Some States OK Viagra for Medicaid Recipients*, PLAIN DEALER, June 18, 1998, at A-6 (stating that New York is reluctant to spend tax dollars to provide Viagra to Medicaid recipients).

149. Individuals have often circumvented government prohibitions to obtain illegal abortions or unapproved treatments and drugs for cancer and AIDS, travelling to Mexico, the Bahamas, and Europe to do so. *See* MEHLMAN & BOTKIN, *supra* note 120, at 119 (showing that the problems of regulating genetic enhancements are not new). One way to avoid this problem is to regulate the provision of genetic enhancement services through international agreements. *See* Sev Fluss, *Legal Aspects of Transplantation: Emerging Trends in International Action and National Legislation*, 24 TRANSPLANTATION PROC. 2121-22 (1992); Christian Williams, *Combating the Problems of Human Rights Abuses and Inadequate Organ Supply Through Presumed Donative Consent*, 26 CASE W. RES. J. INT'L L. 315, 359-64 (1994) (arguing for international agreements that mandate presumed consent as an international standard). Off-shore availability could also be addressed by preventing consumers from accessing or penalizing consumers for accessing genetic enhancement services. Access could be prevented through travel restrictions, just as some countries have done to limit access to abortion services and as the United States has done in prohibiting travel to Cuba, Albania, and China. *See, e.g.*, Zemel v. Rusk, 381 U.S. 1 (1965) (upholding restrictions on travel to Cuba); Seth F. Kreimer, *The Law of Choice and Choice of Law: Abortion, the Right to Travel, and Extraterritorial Regulation in American Federalism*, 67 N.Y.U. L. REV. 451, 452-58 (1992) (outlining travel restrictions placed by several European countries on women seeking abortions). Violators of travel restrictions could lose their passports and be fined or imprisoned for travelling without a passport. *See* Immigration and Nationality Act of 1952, 8 U.S.C. § 1185 (1994) (requiring United States citizens to have a United States passport when departing or entering the United States); Haig v. Agee, 453 U.S. 280 (1981) (upholding revocation of passport for traveling without a passport). Consumers also can be penalized for obtaining genetic enhancement through forfeiture of health care coverage. *See, e.g.*, Mark V. Sauer, *Reproductive Prohibition: Restricting Donor Payment Will Lead to Medical Tourism*, 12 HUM. REPROD. 1844-45 (1997). These penalties rely on customs officials being able to test for the presence of genetic alterations. Courts have allowed routine medical tests on aliens seeking to enter the country. *See* 42 C.F.R. § 34.2(b) (1997) (outlining the procedures regarding medical examination of aliens). While a customs officer may routinely search persons entering the country, even in the absence of a warrant or probable cause, *see* 19 U.S.C. § 482 (1996) (stating the rights and restrictions upon customs officers regarding searches of vehicles and persons), the officer must have reasonable suspicion of an unlawful act. *See* United States v. Himmelwright, 551 F.2d 991 (5th Cir. 1977) (holding that it was reasonable to search a woman who was suspected of carrying drugs). Even were genetic enhancement detected and the individual fined or imprisoned, however, the individual would remain enhanced. Efforts to limit the damage already done, as through sterilization or reversal of the

It will be burdensome to enforce a ban on genetic enhancements because it will be difficult to determine whether or not an individual is illegally enhanced. Accordingly, the enhanced individual, the person who enhanced them, or both may elude punishment. This problem is compounded by the technical difficulties we may encounter in our attempts to detect the presence of enhancement products or enhanced DNA in the human body.[150] A similar problem plagues attempts to ban performance-enhancing drugs in sports. Athletes and their coaches are becoming increasingly adept at deceiving drug screening tests. For example, athletes may use naturally-occurring body builders like erythropoeitin to disguise the exogenous enhancement.[151] Furthermore, athletes may be able to consume an enhancement substance to increase muscle mass, for example, and then terminate its use sufficiently in advance of a screening test so that its consumption cannot be detected.

The enforcement of restrictions on genetic enhancements will be compounded by the degree of difficulty society will encounter in attempting to distinguish between therapeutic and enhancement uses. The difference between the two is frequently not clear.[152] Someone might claim, for example, that an improvement in appearance was required to treat feelings of inadequacy, or that an increase in strength or dexterity was an effort to avoid injury. Moreover, many genetic enhancements are likely to have lawful medical uses.[153] Someone may take human growth hormone to be-

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enhancement, may run into constitutional difficulties. *See supra* note 134 (discussing reproductive freedom). A final method of regulating potential consumers of genetic enhancement is to prevent the transfer of money abroad for purchasing banned genetic technologies. *See* MEHLMAN & BOTKIN, *supra* note 120, at 55-85 (examining potential solutions to suppress an underground market for genetic enhancement). Such measures are likely to be ineffective, however, as the experience with Swiss bank accounts, offshore investment companies, and drug money laundering shows. *See id.* Another method of regulating off-shore access to genetic enhancement is to control the activities of professionals who go abroad to provide these services or refer consumers abroad by limiting biomedical research abroad and holding liable clinicians who refer patients internationally. *See, e.g.*, Sheila Jasanoff, *Biology and the Bill of Rights: Can Science Reframe the Constitution*, 13 AM. J.L. & MED. 249, 275-77 (1987) (providing examples of United States doctors circumventing United States regulations by conducting biomedical research abroad). Any efforts to ban genetic technologies, however, would prevent us from reaping the potential benefits of that technology. *See* MEHLMAN & BOTKIN, *supra* note 120, at 20-37 (highlighting several noteworthy benefits of genetic technologies).

150. For a discussion of what steps may be required to accomplish this, see Part VI Conclusion.

151. *See* John Maher, *Drug EPO Causes Sticky Situations*, AUSTIN AM.-STATESMAN, July 26, 1992, at E3 (explaining that athletes prefer erythropoietin to blood doping because it is more difficult to detect); Ziegler, *supra* note 148 (listing popular performance enhancing drugs such as human growth hormone, erythropoietin, and designer steroids).

152. *See supra* note 19 (discussing therapeutic/enhancement distinction).

153. *See supra* notes 135-38 and accompanying text (discussing off-label enhancement uses

come a professional basketball player, while someone else may take the substance to combat pituitary dwarfism. A ban on enhancements would require a complicated system to distinguish between legitimate and prohibited activities involving the same products.[154] In addition, banning genetic enhancement in conjunction with assisted reproductive technologies, like those delivered in IVF clinics, would require a regulatory regime more extensive than the one currently in place.[155]

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of approved therapeutic products).

154. State and federal drug enforcement officials are largely unsuccessful in stemming the flow of prescription drugs flowing into the illicit drug market. *See* Dan Weikel, *Prescription Fraud: Abusing the System*, L.A. TIMES, Aug. 18, 1996, at A1. According to DEA statistics, approximately 27% of illicit drug use involves prescription drugs. *See* Charles W. Hall, *A Prescription for Trouble in Suburbia; Va. Police Step Up Efforts Against Fraud at Pharmacy*, WASH. POST, May 26, 1996, at B01. The possibility of unintentionally deterring legitimate use of drugs for treating illness and pain makes preventing illicit use of prescription drugs even more difficult. *See* Michael Perrault, *Complexities of Drug Laws Confuse Some Practitioners*, KAN. CITY BUS. J., Feb. 21, 1997, at 4.

155. Until recently, the federal government had not passed legislation specific to fertility clinics. Exaggerated success rates prompted the Federal Trade Commission to take action against fertility clinics in the late 1980s, however, and subsequent congressional hearings resulted in the passage of the Fertility Clinic Success Rate and Certification Act of 1992, 42 U.S.C. § 263a-1 to 263a-7 (1994). The act requires assisted reproductive programs to report success rates to the Center for Disease Control (CDC) so that the statistics may be standardized. *Id.* § 263a-1(a). Also, the Act establishes a voluntary pilot program under which states may work with the CDC and the Department of Health and Human Services to certify fertility clinics. *Id.* § 263a-2. No funds were allocated for the Act's implementation until 1996, however, and the CDC did not publish a success rate report until December 1997, using data from cycles initiated in 1995. *See* NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 401. Nor have states rushed to participate in the pilot program. *See* Note, *In Vitro Fertilization: Insurance and Consumer Protection*, 109 HARV. L. REV. 2092, 2106 (1996).

The Clinical Laboratory Improvement Act (CLIA) allows health officials to monitor clinical laboratories, but "the regulations required under CLIA are too generic for infertility labs." Kathryn Wexler, *Fertile Ground for Deception*, WASH. POST, Jan. 2, 1996, at Z07; *see also* 42 U.S.C. § 263a (1994). Some critics of the current system favor a national regulatory body responsible for licensing and inspecting IVF programs, but the cost of establishing an agency for this purpose may be too costly. *See* John A. Robertson, *Assisted Reproductive Technology and the Family*, 47 HASTINGS L.J. 911, 920-21 (1996). Like federal regulation, regulation by state governments is lacking. While there is some state regulation of infertility clinics, there are not yet any comprehensive laws covering the field. *See* Wexler, *supra*. Louisiana requires that assisted reproductive programs meet standards set by the American Society for Reproductive Medicine (ASRM) and be directed by a licensed physician and trained in IVF. LA. REV. STAT. ANN. § 9:128 (West 1997). New Hampshire requires medical evaluations and procedures be governed by rules adopted by the state health department or, in the absence of any health department rules, guidelines set by the ASRM. N.H. REV. STAT. ANN. § 168-B:31 (1995). Other states require that a licensed physician perform or supervise all assisted insemination procedures. *See, e.g.*, ARK. CODE ANN. § 9-10-202 (Michie 1995); IDAHO CODE § 39-5402 (1998); OHIO REV. CODE ANN. § 3111.32 (West 1997); OR. REV. STAT. § 677.360 (1995).

As a result, most regulation of assisted reproduction is a product of private profes-

The strongest objection to banning genetic enhancements is that both society and well as enhanced individuals benefit from the enhancement. For example, a person with an enhanced scientific ability (assuming that this collection of traits was amenable to genetic manipulation) might make important discoveries that would be impossible, or take much longer, for an unenhanced scientist. Even proponents of equality recognize the need to permit a certain degree of inequality in order to increase social benefit.[156] In short, we might want to permit an individual to be enhanced if we believe that the enhancement will benefit the individual *and* society.

Social benefit, coupled with the practical limits on the effectiveness of a complete ban on genetic enhancements, make a total ban both unrealistic and undesirable. Some people will manage to enhance themselves at any cost. Moreover, in some cases, we will want people to enhance themselves. This leads to several policy suggestions.

One approach could involve enhancement licensing. A system of licensing individuals to obtain genetic enhancements would yield social gains, as well as take some of the pressure off of a regulatory embargo that attempted to prevent the wealthy from purchasing enhancements. Licenses would be granted on the condition that enhanced persons employ their abilities in some pre-defined, socially beneficial manner. By reducing the number of people who obtain enhancements, a licensing program would lessen the degree of social inequality, and the threat that genetic inequality poses to democratic institutions.[157]

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sional organizations. The American Society for Reproductive Medicine (ASRM) sets minimum standards for IVF, gamete intrafallopian transfer, and other related procedures. The ASRM's guidelines require that programs performing these techniques employ individuals with training specified by the ASRM. NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 408. The Society of Assisted Reproductive Technology (SART) accepts standardized statistics from infertility clinics for annual publication. *See* Wexler, *supra*. Those clinics, enrolling as active members of SART, must meet SART's qualifications, but SART does not independently verify compliance with the guidelines. *See id.* The College of American Pathologists (CAP) and the ASRM jointly administer a voluntary laboratory accreditation program, but the cost and time requirements dissuade even some good clinics from participating. *Id.* Only recently did the CDC announce its intention to create a model certification program with CAP and the ASRM. *See* NEW YORK STATE TASK FORCE REPORT, *supra* note 26, at 413. Thus, both government and private regulation of infertility services is lacking, resulting in many horror stories: a doctor using his own sperm to impregnate women, doctors taking eggs from patients for implantation in other patients, a dirty instrument resulting in a couple having one black child and one white child. *See* Wexler, *supra*.

156. *See supra* note 90 and accompanying text (discussing view that some inequality increases net societal benefit).

157. Temkin, for example, contends that a society in which only a few people are much better off than others is more equal than one in which a lot of people are much better off and only a few are much worse off. *See* TEMKIN, *supra* note 86, at 297. The question is whether the gains in equality are worth the costs of interdiction. Even if restrictions are adopted on paper

This licensing system would be similar to legally-enforced professional licensing schemes that give their holders the powers and privileges denied ordinary citizens in return for agreements to abide by rules designed to promote social goals and to refrain from behaving in socially undesirable ways. The system would also bear some resemblance to licensing imposed on the ownership or use of dangerous products like handguns and automobiles. The administrative costs could be financed by licensing fees.

A licensing requirement could be enforced in the first instance against providers of genetic enhancement products or services. Providers would be required to be licensed as a supplier. This license would carry with it restrictions and reporting requirements.[158] Individuals who sought enhancements would apply to a licensing board and would be required to articulate the social benefits that would flow from their enhancement. Applicants who were approved would periodically report to the board to provide assurance of satisfactory performance. Licensed enhancements that involved manipulation of DNA would be genetically "tagged" so that lawfully enhanced individuals could be distinguished from those who obtained enhancements on the black market.[159] Failure to fulfill the terms of the license would be penalized by loss of access to the enhancement or to its benefits. Depending on the nature of the enhancement, the penalties could include deprivation of supplies of the enhancement product, actual biological reversal of the enhancement, various forms of social handicapping,[160] surtaxes or monetary penalties, and perhaps in cases of egregious violations, such as the use of enhancements to cause serious harm to others, imprisonment. Similar penalties would be imposed on persons who were discovered to have supplied or obtained enhancements without being licensed.[161]

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for their symbolic value, the intangibility of these gains compared with the magnitude of the potential costs may well discourage vigorous enforcement.

158. A similar program operates under the Controlled Substances Act to keep track of the prescription of narcotics and other dangerous drugs. *See supra* note 129 and accompanying text (describing regulation of controlled substances).

159. This technology, in which a portion of identifying but non-functioning DNA is inserted along with functional DNA, is already being developed by agricultural biotechnology companies to enable them to trace the use of genetically engineered seeds. *See* Michael Pollan, *Playing God in the Garden*, N.Y. TIMES, Oct. 25, 1998, § 6 (Magazine), at 44. The use of genetic tagging for law enforcement purposes would resemble tagging explosives with a chemical that enables the seller to be identified. *See* Robert F. Service, *NRC Panel Enters Fight Over Tagging Explosives*, SCIENCE, Jan. 24, 1997, at 474.

160. Handicapping is discussed *infra* as a remedy for the unfairness of competitions between enhanced and unenhanced individuals. *See infra* notes 185-86 and accompanying text.

161. I acknowledge that numerous problems remain to be solved with such a regime, and that, like the War on Drugs, it will require careful tuning to avoid overly extensive violations of individual liberties. This article is meant to be the start of a debate, not its conclusion.

One of the more vexing issues that the enforcement of a licensing scheme would

raise, for example, is the issue of genetic privacy. Licensed individuals (and those suspected of obtaining enhancements on the black market) would be required to undergo DNA testing to verify the extent of their enhancements or to disprove the accusation that they were enhanced illegally. DNA is often described as a "future diary," emphasizing the private nature of the information it contains about an individual's future. *See* George J. Annas, *Rules for Gene Banks: Protecting Privacy in the Genetics Age*, *in* JUSTICE AND THE HUMAN GENOME PROJECT 75, 82 (Timothy F. Murphy & Marc A. Lappé eds., 1994). Privacy is a multi-dimensional concept, denoting "(1) informational privacy concerns about access to personal information; (2) physical privacy concerns about access to persons and personal spaces; (3) decisional privacy concerns about governmental and other third-party interference with personal choices; and (4) proprietary privacy concerns about the appropriation and ownership of interests in human personality." Anita L. Allen, *Genetic Privacy: Emerging Concepts and Values*, *in* GENETIC SECRETS: PROTECTING PRIVACY AND CONFIDENTIALITY IN THE GENETIC ERA 31, 33 (Mark A. Rothstein ed., 1997) [hereinafter Allen, *Genetic Privacy*]. While genetic privacy can evoke each of these concerns, it most often refers to informational privacy. The information available from DNA is potentially both sensitive and embarrassing for the individual. *See* Annas, *supra*, at 83. Additionally, the availability of the information to insurance companies and businesses arouses fears of genetic discrimination. *See* Karen Rothenberg et al., *Genetic Information and the Workplace: Legislative Approaches and Policy Challenges*, 275 SCI. 1755 (1997) (describing protections against genetic discrimination in the workplace).

In tension with the desire to protect individual privacy is the potential usefulness of genetic information to third parties. DNA data banks containing DNA "fingerprints" allow law enforcement officials to link a suspect to a crime or to identify a victim's remains. *See generally* Dan L. Burk & Jennifer A. Hess, *Genetic Privacy: Constitutional Considerations in Forensic DNA Testing*, 5 GEO. MASON U. CIV. RTS. L.J. 1 (1994) (discussing the plausible threat of misuse of DNA samples given the shortcomings present in current policy provisions); E. Donald Shapiro & Michelle L. Weinberg, *DNA Data Banking: The Dangerous Erosion of Privacy*, 38 CLEV. ST. L. REV. 455 (1990) (calling for state legislatures to limit DNA uses strictly); JoAnn Marie Longobardi, Note, *DNA Fingerprinting and the Need for a National Data Base*, 17 FORDHAM URB. L.J. 323 (arguing the benefits of a national DNA database); Michael J. Markett, Note, *Genetic Diaries: An Analysis of Privacy Protection in DNA Data Banks*, 30 SUFFOLK U. L. REV. 185 (1996) (recommending actions for Congress and state legislatures to deal with DNA problems). Similarly, defense attorneys may wish to use genetic evidence to exonerate their clients. *See* Mark A. Rothstein, *Genetic Secrets: A Policy Framework in* GENETIC SECRETS: PROTECTING PRIVACY AND CONFIDENTIALITY IN THE GENETIC ERA, *supra*, at 451, 480 [hereinafter Rothstein, *Genetic Secrets*]. Genetic information could also be used as evidence in personal injury cases, allowing defendants to argue that plaintiffs have a below-average life expectancy, or in domestic regulation cases, both to determine parentage and to predict a parent's future health in a child custody hearing. *See id.* at 481-82. Additionally, genetic privacy conflicts with the interests of blood relatives, especially when the information would allow early diagnosis of diseases the onset of which could be avoided by taking early precautions. In such cases, medical professionals are faced with a conflict between confidentiality and the duty to warn. *See* Roberta M. Berry, *The Genetic Revolution and the Physician's Duty of Confidentiality: The Role of the Old Hippocratic Virtues in the Regulation of the New Genetic Intimacy*, 18 J. LEGAL MED. 401 (analyzing the effects on ethics in the wake of greatly changing genetic medicine); Sonia M. Suter, Note, *Whose Genes Are These Anyway? Familial Conflicts Over Access to Genetic Information*, 91 MICH. L. REV. 1854 (1993) (balancing the interests of various family members in genetic controversies). Insurance companies and employers have a strong economic interest in gaining access to genetic information, allowing insurance companies to refuse coverage of at-risk individuals and allowing employers to control costs by not hiring individuals at risk for occupational ill-

Another method might involve establishing an enhancement lottery. The licensing scheme I have so far described would be open only to those people with sufficient financial resources. This would perpetuate the inequalities that would result from wealth-based access to enhancements. To circumvent this problem, society could provide access to enhancements to some people who lacked sufficient resources. One approach would be a government program that subsidized enhancements for certain persons,

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ness. *See* Kathy L. Hudson et al., *Genetic Discrimination and Health Insurance: An Urgent Need for Reform*, 270 SCI. 391 (1995) (recognizing the shortcomings of current law and the need for new legislation); Rothenberg et al., *supra*, at 1755; Rothstein, *Genetic Secrets*, *supra*, at 468-79 (discussing the institutionalization of standards for the review of genetic developments in the insurance industry); Mark A. Rothstein, *The Law of Medical and Genetic Privacy in the Workplace*, *in* GENETIC SECRETS, *supra* at 281 [hereinafter Rothstein, *Medical and Genetic Privacy in the Workplace*] (tracing the historic development of medical privacy in the workplace). Genetic screening programs are in place in over 75 of the nation's largest firms. *See* Shapiro & Weinberg, *supra*, at 480. Schools also have an interest in accessing genetic information as a tool for educational programming. *See* Rothstein, *Genetic Secrets*, *supra*, at 487. Additionally, the United States military has an interest in genetic information, and uses DNA fingerprinting to identify the remains of war casualties, collecting and storing nearly 1.5 million samples by 1996. See *id.*

State legislative efforts to address the genetic privacy issue focus primarily on the illegitimate use to which genetic information is put, rather than access to the information. A handful of states prohibit discrimination on the basis of genetic information of asymptomatic individuals. *See generally* Rothenberg et al., *supra* (describing state laws prohibiting genetic discrimination). Much of the legislation falls short of the goal of protecting genetic privacy because of the narrow definition given to genetic information, limiting the use of information acquired through genetic testing while continuing to allow the use of family history and phenotype indicators in the workplace. *Id.* at 1755. In 1996, however, New Jersey prohibited employment discrimination based on genetic information broadly defined. *See* Natalie Anne Stepanuk, Comment, *Genetic Information and Third Party Access to Information: New Jersey's Pioneering Legislation as a Model for Federal Privacy Protection of Genetic Information*, 47 CATH. U. L. REV. 1105 (1998) (claiming the judiciary must take an active role in keeping up with rapidly changing genetic developments). Most state law provisions protecting genetic privacy appear as "prohibitions on mandatory genetic testing or disclosure of test results for employment or health insurance," informed consent requirements for testing or disclosure of information, "and proclamations of the confidentiality of genetic information." Michael S. Yesley, *Genetic Privacy, Discrimination, and Social Policy: Challenges and Dilemmas*, 2 MICROBIAL & COMP. GENOMICS 19, 20 (1997).

Like state legislation, federal legislation focuses more on the use of genetic information rather than access to such information. The Equal Employment Opportunities Commission (EEOC) has interpreted the Americans with Disabilities Act to prohibit genetic discrimination in the work place. 2 EEOC COMPLIANCE MANUAL § 902.8 (1991). Similarly, 29 U.S.C. § 1811(a)-(g) (1996), prevents group health insurance plans from using genetic information in establishing eligibility rules and from treating genetic information as a preexisting condition absent a diagnosis of the condition. No federal legislation protects genetic privacy, however, and state regulation of prohibition on mandatory genetic testing continues to allow dissemination of genetic information. For example, employers may still make offers of employment conditional on the release of medical records and consent to blood testing. *See* Rothenberg et al., *supra*. Thus, regulation of genetic privacy is limited.

perhaps those who, in return for their license, promised to provide the most desirable set of social benefits. But this would embroil the government in an enhancement rationing program in which it was required to judge the relative merit of different proposals, a task that would raise objections similar to those that have been lodged against health care rationing programs in general.[162] On the other hand, the licensing plan I propose does not raise these objections because the licensing authority would not compare individuals seeking enhancement but would allow anyone to purchase enhancements so long as they agreed to meet certain minimum social objectives.

A more agreeable solution might be to establish a national lottery for genetic enhancements.[163] Everyone would be given one chance in each drawing. The winner, or winners,[164] would be entitled to resources that would enable them to purchase the maximum package of enhancements lawfully available in the private market. However, to qualify for the enhancements, they would have to become licensed. Similar to the licensing program itself, the lottery could be financed by the license fees paid by those who purchased enhancements. Among the advantages of a lottery approach is that its randomness would give continued vitality to the concept of equality of opportunity.

A final proposal might be for regulation of germ line enhancement. Social equality would be threatened particularly by the creation of a genobility—a class of related individuals who use genetic enhancement to achieve and maintain an unassailable grip on wealth, power, and social privilege, and who pass their advantages on to successive generations. A genetic aristocracy is antithetical to the philosophy and ideals upon which liberal democratic political systems rest.[165] If genetic enhancements are obtainable at all, then, to some extent, the formation of an enhanced class

162. For a description of objections to rationing kidney dialysis on the basis of an individual's social worth, see Maxwell J. Mehlman, *Rationing Expensive Lifesaving Medical Treatments*, 1985 WIS. L. REV. 239, 256-60. A different but no less troubling set of objections might be directed at private philanthropic subsidies.

163. Botkin and I proposed this idea earlier in ACCESS TO THE GENOME, *supra* note 120, at 124-28, where we described the history of state-run lotteries, including their use to reduce perceptions of hopeless inequality, their utility in allocating scarce drugs, and their acceptance by the courts as a fair means of distributing unavoidable privations, such as those faced in the classic "life-boat" case, *U.S. v. Holmes*, 26 F. Cas. 360 (E.D. Pa. 1842).

164. The odds of winning could be adjustable, increasing or decreasing depending on political perceptions of the degree of inequality created by wealth-based purchases of enhancements in the marketplace. For a more complete description and defense of a lottery for genetic enhancements, see MEHLMAN & BOTKIN, *supra* note 120, at 124-28 (1998).

165. *See supra* notes 108-10 and accompanying text (describing threats to democracy created by genetic aristocracy).

cannot be prevented. Persons wealthy enough to purchase enhancements would be able to provide their children with greater material advantages than unenhanced persons. Accordingly, these children may also be able to purchase genetic enhancements.[166] Yet the formation of a genobility is far more likely to occur if individuals were permitted to enhance their germ lines. Their offspring would inherit these genetic advantages, which could be supplemented with additional germ line enhancements that they purchased, which in turn would be passed on to their children, and so on.[167]

The social threat created by the inequality that would result from germ line enhancement may not be readily mitigated by the licensing requirement that would accompany the lawful acquisition of somatic enhancements. It is difficult to imagine how to ensure that the person's child would abide by the licensing conditions to which his or her parents consented. Society could require enhanced children to become licensed upon reaching the age of majority or else forfeit their enhancement advantages.[168] Being licensed at the age of majority may not be sufficient, however, to counteract the inequality that occurred at an earlier age.[169]

In this case, the solution would seem to require prohibiting germ line genetic enhancement altogether. Conceivably the threat to social equality could be met by banning only those forms of germ line enhancement that involved gene transfer, and not the passive sorts of germ line enhancement that would occur with genetic selection for enhancement, selective abortion for enhancement, or pre-conception enhancement. Given the constitutional protection of reproductive freedom, it might be more politically realistic to make it illegal for individuals to alter germ cells for enhancement reasons than to discover their genetic endowment, to select embryos for implantation, or to abort a fetus.

A ban on germ line engineering would raise numerous, but not insurmountable, problems. For example, some may contend that a ban unconstitutionally interferes with procreative liberty.[170] Yet the state may assert a

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166. This is one of the reasons for implementing a program to reduce unfairness, described below. *See infra* notes 171-204 and accompanying text.

167. The intergenerational transmission of enhanced traits will not be completely automatic. Enhanced DNA material may be altered during the reproductive process, for example, by recombination or "crossing-over" of chromosomes, resulting in the cancellation of the enhancement effect. For a description of crossing-over, see Dennis S. Karjala, *A Legal Research Agenda for the Human Genome Initiative*, 32 JURIMETRICS 121, 136 (1992).

168. For a description of the ways in which enhanced individuals could be stripped of their advantages, and of methods to level the playing field between enhanced and unenhanced persons, see *infra* notes 170-204 and accompanying text.

169. Moreover, the children may have been able to employ their enhancement advantages to too large a degree during their period of legal minority.

170. For a discussion of the constitutional dimensions of this liberty right, see *supra* note

compelling interest in preserving democratic liberties from being engulfed by a genetic aristocracy. Detecting altered germ cells would be difficult and intrusive.[171] Nevertheless, the intrusiveness may be necessary to promote a minimum level of genetic equality.

V. UNFAIRNESS

Regardless of the manner in which we attempt to reduce the inequalities that would be created by wealth-based genetic enhancement, genetic enhancements are inevitable. A vigorously and effectively enforced licensing scheme would go some distance toward offsetting the advantages enjoyed by enhanced persons, but not far enough. Enhanced individuals would be in a more privileged social position than unenhanced persons. This raises the question of whether, and in what ways, society can curb genetically produced unfairness.[172]

This unfairness will be most acute when the unenhanced compete with the enhanced for scarce societal resources, or when an enhanced individual exerts power over an unenhanced person in a relationship in which their

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171. The difficulty of prohibiting germ line enhancement is illustrated by the protocol proposed to NIH in August of 1998 by French Anderson. Anderson sought to remedy ADA deficiency disease and alpha thalassemia by genetically altering cells in an early-stage fetus. Since the fetus' cells would not have been completely differentiated, some of the genetic alterations might be incorporated into cells that eventually would develop into reproductive cells, with the result that the alterations would be passed on to the fetus' own offspring. *See* Robert Cooke, *Pushing a Human Limit: Gene Therapy That Could Affect Future Generations, Too*, NEWSDAY, Aug. 30, 1998, at A06.

172. Many of the philosophers who are concerned about inequality at a societal level are also troubled by the consequences of inequality at the personal level. Walzer, for example, argues that the problem is not so much inequality per se, but how the superior person behaves toward the inferior: "The experience of subordination—of personal subordination, above all—lies behind the vision of equality." WALZER, *supra* note 77, at xiii. Indeed, his goal of maintaining separate spheres of justice—which prevent a person from attaining a privileged position in one sphere merely because she enjoys an advantage in another—is aimed at precluding the domination of one person or class by another. *See id.* at 17. Bruce Ackerman actually posits the notion of "genetic domination," although he focuses on the domination of the genetically disadvantaged by those who fare better in the natural lottery, rather than on the domination of the unadvantaged by the genetically enhanced. *See* BRUCE ACKERMAN, SOCIAL JUSTICE IN THE LIBERAL STATE 132 (1980). Even meritocrats are uncomfortable when the talented lord it over others. Gardner, for example, states that "[i]n its moderate forms—held within bounds—emphasis on individual achievement allows a healthy play of individual gifts, holds out an invitation to excel, but does not necessarily sanction the ruthless subordination of those who are less able, less vigorous, or less aggressive." GARDNER, *supra* note 83, at 35. Nozick, as mentioned earlier, considers theft, fraud, and the forcible exclusion of others from competition as examples of activities that create "unjust holdings." NOZICK, *supra* note 78, at 152.

interests conflict.[173] These circumstances can occur in a large number of settings: between rivals for someone's affection, or in interpersonal relationships, like those between romantic partners; in contests, including sports, games, beauty pageants, and talent shows; in competition for access to limited privileges, such as admission to academic institutions; in fiduciary relationships, like those between patients and health care professionals, trustees and beneficiaries, directors and shareholders, attorneys and clients, and insurers and insureds; and in ordinary business relationships, such as those between seller and buyer, landlord and tenant, realtor and purchaser, lender and debtor, manufacturer and consumer, and employer and employee. The object of the competition may be any desirable good: money, employment, status, affection, sexual favors, political influence, or market power. The relative advantage conferred by genetic enhancement would depend on both the context and the nature of the enhancement; in a test of strength, for example, enhanced intelligence may be of little value.[174] Unfairness could be either a zero-sum situation in which the enhanced person obtained benefit at the unenhanced person's expense, or a situation in which both the enhanced and the unenhanced person gained, but the share gained by the enhanced person was proportionately greater than would be the case if the parties were equivalently advantaged.

To a certain degree, all of these situations are subject to external rules of behavior. These rules may be formal public laws; legally enforceable private law, such as the by-laws and other governing principles adopted by corporations, partnerships and unincorporated associations; or social

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173. In particular, I am concerned with zero-sum games, in which the enhanced would gain at the expense of the unenhanced. As Powers states, "[t]he true object of egalitarian moral concern . . . must be those inequalities that permit some to benefit greatly only by making others substantially worse-off . . . ." Powers, *supra* note 91, at 138. *But cf.* NOZICK, *supra* note 78, at 228 ("Life, over time, is not a constant-sum game, wherein if greater ability or effort leads to some getting more, that means that others must lose."). I also am troubled by competitions in which, although both the enhanced and the unenhanced gain, as a result of the advantages enjoyed by the enhanced, the gains are unequal. Many of the advantages conferred by genetic enhancement may not be at the expense of others, however. As Nagel points out:

> Any advantage to the better off at no cost to the worse off is all to the good, even if it is due to causes for which the recipients are not responsible . . . . For example, there can be no possible objection to some people's naturally enjoying immunity to certain diseases or perfect health or sunny dispositions, even though this makes them much better off than those who are constitutionally sickly or depressed.

NAGEL, *supra* note 84, at 107.

174. See *infra* notes 200-01 and accompanying text for a discussion of the complexities raised by the possibility that A, who has an enhanced trait X, competes against B who has enhanced trait Y, which confers different advantages than trait X, or against C, who is not enhanced but who enjoys other natural or acquired advantages.

norms or customs.[175] How should these systems of rules respond to the potential unfairness created by genetic enhancement? Should the rules treat these differences as if they did not exist or did not bear on the activity? Or should the rules attempt, in some fashion, to level the playing field? If one person possessed an advantage over another, should the rules permit that individual to reap its benefit at the other's expense?[176] Although it would be fascinating to consider non-legal responses based on social norms and customs, the focus of the remainder of this paper will be on legally enforceable rules, that is, on public and private law.

If we attempted to level the genetic playing field in response to genetic enhancement, what would our options be? We can either decrease the advantages of those persons who were genetically enhanced, or we could improve the lot of the unenhanced. In short, we can level "up" or "down."

Leveling up would entail giving those who were not genetically enhanced some countervailing benefit. This could be money, professional advice, information that was hard to come by, or any other desirable resource that would help level the playing field. It could be a preference in access to a scarce resource—an affirmative action program, for example. Yet it is difficult to conceptualize how this approach would work in the context of personal interactions. Would an unadvantaged person be permitted to draw on some public store of resources to place her on the same level as the enhanced person? Since we cannot afford to provide genetic enhancement to everyone, the stock would not consist of genetic enhancements. Yet, desirable resources are scarce. Accordingly, it would cost too much to put the unadvantaged on the same level as the enhanced.

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175. There does not appear to be any consensus on the proper use of the terms "law," "norms," and "customs." A good illustration of the confusion is one commentator's remarks that, based on differences in enforcement, "a norm is like a law, except that a private person sanctions the violator of a norm, whereas a state actor sanctions the violator of a law," which the commentator then follows with the observation that, based on the source of the rule, the term "norm" does not include "the rules self-consciously formulated and issued by private institutions, such as trade associations." Eric Posner, *Law, Economics, and Inefficient Norms*, 144 U. PA. L. REV. 1697, 1699, 1700 (1996). Because a trade association might be subject to a legal sanction for breach of contract for violating its by-laws, it is hard to figure out why this author would not consider its rules to be norms, if not laws (albeit private ones). In any event, in this Article, I use the terms as follows: a public law is a rule made and sanctioned by the government; a private law is a legally enforceable rule made by a non-governmental organization; and a social norm or custom is a rule established by custom and usage that is not legally enforceable.

176. *See* 3 WILLIAM BLACKSTONE, COMMENTARIES *2 ("Courts of justice are instituted in every civilized society, in order to protect the weak from the insults of the stronger . . . ."). *But see* Truax v. Corrigan, 257 U.S. 312, 332 (1921) ("Our whole system of law is predicated on the general, fundamental principle of equality of application of the law. 'All men are equal before the law . . . .'").

A less expensive alternative might be to level up only those who, relative to the enhanced, were the most disadvantaged. This would resemble laws prohibiting employment discrimination against persons with disabilities.[177] These laws require employers to subsidize persons with disabilities so

177. A great deal of attention has been paid by scholars and lawmakers to this manifestation of the general issue of potential unfairness: when individuals are disadvantaged compared to others according to some societal norm (here I am not using the term "norm" to refer to an informally sanctioned rule, but to the frequency of a characteristic in the population which is accepted as "normal"), or when individuals are treated as if they were disadvantaged. A bevy of legislative enactments, federal and state, together with innumerable court decisions and scholarly writings, for example, deal with fairness toward persons with physical and mental disabilities. *See, e.g.*, Rehabilitation Act of 1973, 29 U.S.C. § 705 (20)(A) (1998) (defining "individuals with disability"); Americans with Disabilities Act, 42 U.S.C. § 12102 (1999) (defining disability); School Bd. of Nassau County v. Airline, 480 U.S. 273 (1987) (holding that tuberculosis is a disability for an elementary school teacher); Steven B. Epstein, *In Search of a Bright Line: Determining When an Employer's Financial Hardship Becomes "Undue" Under the Americans with Disabilities Act*, 48 VAND. L. REV. 391 (1995); Daniel A. Malin & Scott A. Moss, *Public Funding for Disability Accommodations: A Rational Solution to Rational Discrimination and The Disabilities of the ADA*, 33 HARV. C.R.-C.L. L. REV. 197 (1998); Stephen L. Mikochick, *The Americans with Disabilities Act: A Model for Title VII Enforcement*, 2 CORNELL J.L. & PUB. POL'Y 25 (1992); Rosalie K. Murphy, *Reasonable Accommodation And Employment Discrimination Under Title I of the Americans with Disabilities Act*, 64 S. CAL. L. REV. 1607 (1991); Jeffrey O. Cooper, Comment, *Overcoming Barriers to Employment: The Meaning of Reasonable Accommodation And Undue Hardship in the Americans with Disabilities Act*, 139 U. PA. L. REV. 1423 (1991). Protections are also provided for those who are disadvantaged by virtue of being uneducated or poor, or who come from an oppressed racial or ethnic background. *See, e.g.*, Strauder v. West Virginia, 100 U.S. 303 (1879) (striking down as unconstitutional a state law excluding African Americans from jury service, stating that the purpose of the post-Civil War Amendments was "to secure to a recently emancipated race . . . all the civil rights that the superior race enjoy"); Yick Wo v. Hopkins, 118 U.S. 356 (1886) (finding a denial of equal protection in the application of a facially neutral law administered against Chinese applicants for building permits); Trimble v. Gordon, 430 U.S. 762, 776 (1977) (Rehnquist, J., dissenting) (stating that "[t]he Framers obviously meant [equal protection] to apply to classifications based on "national origin, the first cousin of race").

Dworkin suggests that disabilities are not different in kind from lack of advantage: "Though skills are different from handicaps, the difference can be understood as one of degree: we may say that someone who cannot play basketball like Wilt Chamberlain, paint like Piero, or make money like Geneen, suffers from an (especially common) handicap." Dworkin II, *supra* note 70, at 314-15. Yet Dworkin's parenthetical puts his finger on the difference. A disability is a disadvantage relative to a societal standard, albeit a standard that in some cases is merely arbitrary or based on prejudice. That is, it is a difference between the individual and the large part of the relevant population. Lack of advantage, on the other hand, reflects a condition which, although it is within the same range as the bulk of the rest of the population, is deficient relative to someone else. As has been pointed out elsewhere, this analysis acknowledges that what is deemed a disability or a lack of advantage, being relative, may change between different populations and over time. If by virtue of diet or exercise, most people in the future were to bench-press 500 pounds, the person who could bench-press only 50 pounds, while arguably not disabled in today's world, might be regarded as such in that future society. Similarly, recall Erasmus' homily that, in the country of the blind, the one-eyed man is king. THE OXFORD DICTIONARY OF QUOTATION 278 (4th ed. 1992).

that in competitions for employment they can contend with persons who are not disabled.[178] This tactic levels the employment playing field precisely because only the disadvantaged employees or applicants for employment receive the benefit.

This approach is intuitively appealing. Much like Rawls' difference principle, the focus is on improving the position of the worst off.[179] Yet it would produce odd results if it were applied to a more realistically complex society in which some people were enhanced, some (the unenhanced) were merely "normal," and some were disadvantaged. If through access to countervailing benefits, the disadvantaged were truly brought up to the level of the enhanced, they would surpass those who previously had been neither advantaged nor disadvantaged. The formerly unadvantaged would eventually constitute the disadvantaged. Unless everyone were made equal, a policy of benefiting the worst-off would ultimately create an infinite regression.[180] Hence, there would always be a disadvantaged group at risk for

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The law appears to have little concern for the unfairness that arises at the interpersonal level when one person is advantaged and the other person, while not disadvantaged compared to societal norms, is at a comparative disadvantage. Elites do not seem to attract significant legal attention, at least not systematically. A number of explanations might be offered for this curious state of affairs. Historically, the law may have found it too difficult to identify and measure superiority, or at least certain kinds of superiorities, such as those of the mind. A similar explanation is said to account in part for the peculiar doctrine in tort law that physical but not mental impairments alter the standard of care. *See, e.g.*, RESTATEMENT (SECOND) OF TORTS § 283B, cmt. b (1965); Stephanie I. Splane, Note, *Tort Liability of the Mentally Ill*, 93 YALE L.J. 153 (1983). Alternatively, the societal benefits from elite accomplishment may be deemed to outweigh the costs of unfairness, an issue which is discussed more fully below at notes 196-97 and accompanying text. Of course, it is always possible that, as the devotees of the critical legal studies movement contend, the law simply is a tool wielded by the ruling elites predominantly for their own benefit. *See* Allan C. Hutchinson & Patrick J. Monahan, *Law, Politics, and the Critical Legal Scholars: The Unfolding Drama of American Legal Thought*, 36 STAN. L. REV. 199 (1984) (describing, along with other articles in this symposium issue, the essence of critical scholars' views).

178. In an attempt to resolve the tension between fairness and efficiency, the law only requires the employer to provide a "reasonable" amount of subsidy, in the form of a "reasonable accommodation" or "reasonable modification." *See generally* Mehlman et al., *supra* note 118 (describing reasonable accommodation under the ADA).

179. *See supra* note 88 and accompanying text (discussing Rawls' view of justice). To more accurately reflect Rawls' difference principle, this approach would be expressed as follows: Wealthy people will only be permitted to obtain genetic enhancement if this resulted in some countervailing benefit for the worst-off. Although Rawls himself might be content with benefit in the form of a trickle-down from the accomplishments of the enhanced, leveling up would provide direct subsidies to the worst-off, at least when they competed with the enhanced.

180. This problem, of course, plagues affirmative action programs, and lies in large part behind the successful constitutional challenges that have been asserted against them:

> Those whose societal injury is thought to exceed some arbitrary level of tolerability then would be entitled to preferential classifications at the expense

being treated unfairly by the enhanced and also, under a genetic "affirmative action program," by the formerly disadvantaged who had been leveled up.

We may, however, decide to level down. Since we cannot prevent all people from obtaining genetic enhancements for themselves or their children, unfairness might be avoided by preventing enhanced persons from taking advantage of their enhancements when competing with the unenhanced or exerting power over them.

We can identify methods that may level down the playing field by reviewing how rules currently respond to the potential unfairness inherent in interactions between unequal individuals. Here, instead of advantages conferred by genetic enhancement, society is concerned with natural or acquired advantages like beauty, strength, intelligence, social status, or money. By examining current public and private law, we see a number of ways in which the rules attempt to level the playing field by reducing the relative benefit of these sorts of advantages. For example, in some cases, we prohibit unfair competition. A private law example is the ban on the use of performance-enhancing drugs in sports competitions.[181] Rowing and wrestling competitions are separated into weight classes. In these competitions, athletes who have an advantage in weight are precluded from competing with those who weigh less.[182]

Banning competitions between advantaged and unadvantaged individuals is not confined to sports. The Securities and Exchange Commission, for example, prohibits insider trading. Here the advantage is information that is not available to the public about a corporation whose stock is publicly traded. The law attempts to prevent those who possess this information from converting it into financial gain. The advantaged individual is given

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> of individuals belonging to other groups. Those classifications would be free from exacting judicial scrutiny. As these preferences began to have their desired effect, and the consequences of past discrimination were undone, new judicial rankings would be necessary.

Regents of the Univ. of Cal. v. Bakke, 438 U.S. 265, 297 (1978). Advocates of affirmative action attempt to justify preferences in part on the basis that those who are given preferences belong to historically disadvantaged groups, while those who now become disadvantaged belong to historically favored groups, but it is unclear how this treats the newly disadvantaged *individual* fairly. "Nothing in the Constitution supports the notion that individuals may be asked to suffer otherwise impermissible burdens in order to enhance the societal standing of their ethnic groups." *Id.* at 298.

181. *See* United States Olympic Committee, *Drug Control Education* (last modified January 24, 2000) <http://www.olympic-usa.org/inside/in_1_3_7_1.html> (describing various drugs that are prohibited by the United States Olympic Committee including those that enhance performance such as stimulants and anabolic agents).

182. *See* DIAGRAM GROUP, RULES OF THE GAME 46-49 (Jack Wilkinson ed., Paddington Press Ltd. 1974) (describing the weight limits in boxing and wrestling).

the choice of either disclosing the information or not trading stock in the company.[183]

In other instances, the rules permit a transaction to take place only if the person with the advantage shares it with the unadvantaged. For example, the law of contracts sometimes requires the sharing of information in certain business transactions. This occurs when the advantaged person knows that "disclosure of the fact would correct a mistake of the other party as to a basic assumption on which that party is making the contract," and non-disclosure would be a failure to act in good faith and "with reasonable standards of fair dealing."[184] Presumably these transactions are not prohibited altogether because it is not too costly to enforce the forfeiture rule and there is a sufficiently high possibility that, given adequate enforcement of the rule, the result will be fair.

Similarly, in some cases, society handicaps the person with the advantage. This occurs, for example, in horse racing where jockeys who weigh less than their cohorts are deprived of their advantage by having to carry weights.[185] Better golfers are also deprived of their advantage by removing

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183. Although Congress has addressed the issue of insider training through the Insider Trading and Securities Fraud Enforcement Act of 1988, Pub. L. No. 100-704, 102 Stat. 4677 (1988), and the Insider Trading Sanctions Act of 1984, Pub. L. No. 98-376, 98 Stat. 1264 (1984), there is no statutory definition of insider trading. The courts and the Securities and Exchange Commission primarily based the prohibition on insider trading on S.E.C. Rule 10b-5 (17 C.F.R. §240.10b-5 (1999)), which prohibits employment of manipulative and deceptive devices. *See* Cady, Roberts & Co., 2d Securities Exchange Act Release No. 34-6668, 40 S.E.C. 907 (Nov. 8, 1961) *available in* 1961 WL 3743, at *4 (stating that "[i]ntimacy demands restraint lest the uninformed be exploited"). The scope of the prohibition was circumscribed in *Chiarella v. United States*, 445 U.S. 222, 223 (1980) (holding that an individual possessing information not available to the public, but who is not a corporate insider, does not violate the prohibition on insider trading in the absence of a relationship between the individual and the seller that gives rise to a special duty). In *United States v. O'Hagan*, 521 U.S. 642, 643 (1997), however, the Court reaffirmed that a person violates the insider trading prohibition when "he misappropriates confidential information for securities trading purposes, in breach of a duty owed to the source of the information," protecting the securities markets from abuse by corporate outsiders. Additionally, S.E.C. Rule 14e-3 (17 C.F.R. § 240.14e-3) prohibits insider trading in the context of tender offers. For a discussion of an alternative source of a definition of insider trading, see Steve Thel, *Statutory Findings and Insider Trading Regulation*, 50 VAND. L. REV. 1091 (1997) (discussing the implications of a provision of the Insider Trading and Securities Fraud Enforcement Act on the law of insider trading, and exploring the use of statutory law findings as a technique for establishing substantive law).

184. RESTATEMENT (SECOND) OF CONTRACTS § 161(d) (1981); *see* Ollerman v. O'Rourke Co., 288 N.W. 95 (Wis. 1980) (holding that a vendor had a duty to inform a non-commercial purchaser of residential lot of the existence of an underground well).

185. A wicked depiction of handicapping the talented is provided by Kurt Vonnegut in the short story *Harrison Bergeron*, which begins:

> The year was 2081, and everybody was finally equal. They weren't only equal before God and the law. They were equal every which way. Nobody was

strokes from the score of other golfers.[186]

In other cases, the rules do not prohibit the competition, but allow the unadvantaged to avoid the outcome if it seems too unfair. The doctrine of unconscionability in contracts—which applies to advantages in the form of information or market power—is this type of rule.[187] Another example is the fiduciary rules that permit a court to void a transaction by a trustee of a trust if the result would be unfair to the beneficiaries.[188]

> smarter than anybody else. Nobody was better looking than anybody else. Nobody was stronger or quicker than anybody else. All this equality was due to the 211th, 212th, and 213th Amendments to the Constitution, and to the unceasing vigilance of agents of the United States Handicapper General.

KURT VONNEGUT, *Harrison Bergeron, in* WELCOME TO THE MONKEY HOUSE 7 (1968); *See also* DIAGRAM GROUP, RULES OF THE GAME, *supra* note 182, at 258 (describing that "weights are adjusted to try to give horses an equal chance of winning").

186. *See* Blakney Boggs, *Your Game Handicaps Help Promote Equal Competition*, ORANGE COUNTY REGISTER, Aug. 13, 1998, at D13 (explaining that a handicap "is a way to level out the playing field between golfers of different abilities"); *see also* Greg Wilcox, *See Blue, Tee from the White; Forward Tees Mean More Iron*, L.A. DAILY NEWS, Aug. 6, 1998, at S8 (describing how players are grouped according to their handicaps so that they can compete against golfers of similar skill).

187. *See* RESTATEMENT (SECOND) OF CONTRACTS § 153 (1981); *id.* § 208 ("[I]f a contract or term thereof is unconscionable at the time the contract is made a court may refuse to enforce the contract."); Williams v. Walker-Thomas Furniture Co., 350 F.2d 445 (D.C. Cir. 1965) (stating that a contract may be unconscionable if there is "an absence of meaningful choice on the part of one of the parties together with contract terms which are unreasonably favorable to the other party"); Brooklyn Union Gas Co. v. Jimeniz, 371 N.Y.S.2d 289 (N.Y. Sup. Ct. 1975) (holding as unconscionable a contract written in English only and entered into by the defendant, who spoke and read only Spanish, without the plaintiff's representative explaining the terms to him); Jones v. Star Credit Corp., 298 N.Y.S.2d 264 (N.Y. Sup. Ct. 1969) (holding as unconscionable defendant's sale of a $300 freezer for $1,234.80, including credit charges, to the plaintiffs, who were welfare recipients). *See generally* Friedrich Kessler, *Contracts of Adhesion—Some Thoughts About Freedom of Contract*, 43 COLUM. L. REV. 629 (1943) (discussing adhesion contracts). Having found a contract to be unconscionable, the court may protect the disadvantaged individual by refusing to enforce the contract, enforcing the contract without the unconscionable clause, or limiting the application of the unconscionable clause so the result is not unconscionable. *See* U.C.C. § 2-301(1) (1981).

188. *See* 1 AUSTIN SCOTT & W. FRATCHER, THE LAW OF TRUSTS § 2.5, at 43 (4th ed. 1987) ("If the fiduciary enters into a transaction with the beneficiary and fails to make a full disclosure of all circumstances known to him affecting the transaction, *or if the transaction is unfair to the beneficiary*, it can be set aside by him.") (emphasis added). Elsewhere Scott states: "Where he deals directly with the beneficiaries, the transaction may stand, but only if the trustee makes full disclosure and takes no advantage of his position and the transaction is in all respects fair and reasonable." 2 AUSTIN SCOTT, THE LAW OF TRUSTS § 170.25, at 1387 (3d ed. 1967). Scott also states: "In the case of a purchase by a trustee of the trust property with the consent of the beneficiaries, however, it would seem that if the price is not fair the transaction can be set aside even though the trustee made full disclosure." *Id.* § 496, at 3536; *see also* Alison Anderson, *Conflicts of Interest: Efficiency, Fairness and Corporate Structure*, 25 UCLA L. REV. 738, 760 (1978) ("Where bargaining power is roughly equal, specific fiduciary duties can be waived by

Finally, rules sometimes level the playing field by eliminating the arm's length nature of a transaction. The advantaged person is permitted to engage in the transaction, but is not allowed to employ the advantage in a manner that takes advantage of the other party. This is the result of fiduciary rules that mandate the fiduciary's undivided loyalty towards the entrustor and prevent the fiduciary from serving an interest other than that of the beneficiary.[189]

In other cases, however, the rules do not attempt to level the playing field, preferring instead to ignore or even to celebrate the advantages that some people have over others. With the exception of affirmative action programs, for example, admissions criteria at selective educational institutions do not adjust applicants' accomplishments in light of their background or abilities. A person applying to Harvard with an IQ of 120 competes with applicants with IQ's of 160; the fact that an A in AP Calculus or a high score on the SAT's achieved by the person with the 120 IQ is a far greater accomplishment than the same grade achieved by the person with the 160 IQ, is irrelevant.[190] Many athletic competitions force athletes to compete with those who are considerably younger. Older baseball and basketball players sometimes compete against players straight out of high school.[191] Shorter basketball players are not allowed to shoot from steplad-

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the parties on the basis of full disclosure to and consent by the client. Because informational disparities so often mean that bargaining power is unequal, however, all fiduciaries have an unwaivable obligation of fairness toward the other party.").

189. *See* Meinhard v. Salmon, 164 N.E. 545, 546 (N.Y. 1928) (stating that the fiduciary has a duty of "undivided loyalty"); City Bank Farmers Trust Co. v. Cannon, 51 N.E.2d 674, 675-76 (N.Y. 1943) (reiterating the duty of loyalty); RESTATEMENT (SECOND) OF TRUSTS § 170 (1959) (requiring a duty of loyalty).

190. Gardner, for example, actually extols standardized testing because it ignores family background:

> It is now argued that the tests give an advantage to the individual of good family background and place the individual of poor family background at a disadvantage. This is true in some measure. But it must never be forgotten that the tests introduced an objectivity into the measurement of human abilities that never before existed. Before the tests were developed a great many people seriously believed that the less-educated segments of society were not *capable* of being educated. And the view is still prevalent in many societies.

GARDNER, *supra* note 83, at 63.

191. *See* Tom Verducci, *Kids' Stuff*, SPORTS ILLUSTRATED, Apr. 4, 1994, at 50 (describing baseball as a young man's game); *see also* Tom McNichol, *Is There a Generation Gap in Pro Sports?*, USA WEEKEND, Apr. 5, 1998, at O16 (describing the generation gap in basketball and the lack of respect from younger players, some of whom are "still hanging out with their high school buddies"); *cf.* Valerie Lister, *Study Shows No Direct Link of Age, Injury Rate*, USA TODAY, Oct. 28, 1997, at 12C (stating that younger players have a higher sports-related injury rate than older players).

ders, and there are no professional leagues for players of "normal" height.[192] In football, the slight take the field at their peril.

This raises the question of whether the unfairness problem incited by wealth-based genetic enhancement should be ignored, as it is with college entrance criteria and in certain sports settings.[193] What would justify ignoring the problem?

In many cases, the fact that the rules ignore advantages, or certain advantages, is probably arbitrary, coincidental, or an historical artifact of no theoretical significance. In horse racing, for example, jockey's weights are equalized on the premise that it is the quality of the horse and the jockey's horsemanship that should matter.[194] There are no weight categories in football because that is just not how the game was conceived. Organized chess competition only recently began to prohibit the use of cognitive enhancers like nicotine or stimulants.[195]

Nevertheless, we can posit several principled reasons why it may be inappropriate to deprive genetically enhanced individuals of their advantage in specific transactions or relationships.

First, allowing certain unfair advantages would prevent the loss of societal benefit from the transaction. An enhanced scientist, for example, presumably enjoys personal advantages by virtue of being enhanced. But

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192. Apparently an effort was once made to establish such a league, without success. *See* Elizabeth Comte, *WBL: A Short Circuit with a Worldwide Reach*, SPORTING NEWS, May 21, 1990, at 44 (describing the efforts of players to meet the maximum height requirement of the WBL); Brian Hanley, *World Basketball League Rules*, CHI. SUN-TIMES, May 15, 1998, at 79 (describing the differences between the WBL and the NBA).

193. Not everyone agrees that leveling down is an appropriate solution. For example, Gardner states with disdain:

> [I]n efforts to minimize differences in performance, we can detect not only the hand of the generous person who honestly regrets that some must lose the foot race but the hand of the envious ones who resent achievement, detest superiority in others, and will punish eminence at every opportunity. These latter are the ones Henri Becque had in mind when he said, "The defect of equality is that we only desire it with our superiors."

GARDNER, *supra* note 83, at 109-10. Nagel objects to an egalitarian position that "would permit haute cuisine, haute couture, and exquisite houses to disappear just because not everyone can have them." NAGEL, *supra* note 84, at 138. Under his insurance-based scheme, Dworkin would not redistribute resources to people because they lacked talent so long as they were able to earn, or to insure themselves against not earning a moderate wage. Dworkin's logic is interesting: While almost everyone would buy insurance against not earning a moderate wage, no one would buy insurance against not earning an enormous income because the cost of the insurance would be too great, since almost everybody would be entitled to a payout. *See* Dworkin II, *supra* note 70, at 314-21.

194. *See* DIAGRAM GROUP, RULES OF THE GAME, *supra* note 182, at 258.

195. *See Chess: Drug Testing Has Arrived*, N.Y. TIMES, Nov. 16, 1999, at D7 (describing new Spanish requirements that chess competitors be tested for amphetamines and other drugs).

despite the unfairness to unenhanced persons who compete with her for admission to MIT or in developing patentable inventions, we might forego trying to strip her of her personal benefits. By allowing her to benefit personally, we encourage people like her to purchase scientific enhancements that benefit society. This might well be the justification for not leveling the playing field in terms of intelligence in the case of admissions to institutions of higher learning.

An example of a societal benefit that might sufficiently justify allowing enhanced individuals to retain personal benefit are reductions in the costs of accidents. A naturally talented automobile mechanic might be expected to make safer repairs than someone with less talent, and therefore might be entitled to a hiring preference over someone who lacked her abilities.[196] The same might be said for an enhanced automobile mechanic. The argument becomes even more compelling in the case of persons responsible for the safety of large numbers of people: airline pilots, railroad engineers, operators of nuclear power plants, and the like.[197] In these situations, there

196. Gardner gives the example of an airplane mechanic. *See* GARDNER, *supra* note 83, at 120. A similar consideration operates in the field of disability discrimination. Employers are required to make reasonable accommodations to enable disabled employees to function in their firms, but not if the disabled person would create an unreasonable risk of harm to coworkers or to the public. *See* DiPompo v. West Point Military Academy, 770 F. Supp. 887, 894 (S.D.N.Y. 1991) (holding that the government need not accommodate the plaintiff's dyslexia in his application for a position as a firefighter because "plaintiff could not engage in routine training, inspection and response to emergencies using necessary materials, including the hazardous materials handbook").

197. One story, probably apocryphal, has a conference of geneticists and ethicists pondering the case of an airline pilot who had inherited a propensity to suddenly black out, and wondering whether it would be fair to prevent him from flying. As the debate wore on, one attendee who had to leave early to catch a plane interrupted with: "Just tell me what airline he flies for."

An interesting analogy arises in the law of torts. In general, people are held to the standard of a "reasonable person" under like circumstances. RESTATEMENT (SECOND) OF TORTS § 283 (1965). A failure to behave like a reasonable person, which causes injury to another, subjects the actor to tort liability. This standard is modified, however, in the case of an actor who is physically (but not mentally) disabled. *See id.* § 283C. We hold a blind person to the standard of a reasonable *blind* person. If we wanted to impose a duty on enhanced individuals to employ their superior traits to avoid accidents, we would not hold them to the standard of a reasonable person, but to the standard of a reasonable *enhanced* person. Thus, a driver whose vision had been enhanced to better than 20/20 would not merely be held to the standard of a reasonable, unadvantaged individual, but to the standard of a reasonable person with superior vision. If the enhanced driver should have spotted a child running across the road in time to stop the car, even though a person with normal vision could not have seen the child, then under an enhanced person's standard, the driver could be liable for failing to stop in time. The enhanced person would be treated much the same way that professionals are treated, that is, held to a higher standard of care than non-professionals.

RESTATEMENT (SECOND) OF TORTS § 289 appears to take this approach. It states:

might be a concern about which people will become enhanced pilots, yet all agree that having enhanced pilots is beneficial.

Second, there will be a certain level of difficulty in detecting enhancement. If enhancement cannot be detected, then systems of rules might have no choice but to ignore the unfairness created by competitions involving

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"The actor is required to recognize that his conduct involves a risk of causing an invasion of another's interest if a reasonable man would do so while exercising . . . such superior attention, perception, memory, knowledge, intelligence, and judgment as the actor himself has." There are a few cases in which the courts have held people with superior abilities to a higher standard, but most of these involve professionals. In an interesting remark in *Dillenbeck v. City of Los Angeles*, 446 P.2d 129, 136 n.10 (Cal. 1968), however, the California Supreme Court reasoned that a professional, such as an attorney or physician, is held to a higher standard of care than a lay person because of the professional's greater expertise, rather than because the professional holds herself out as such: "Essentially, the 'expert' cases flow from the proposition that each person in society is expected to exercise that degree of care which can reasonably be anticipated from him in light of his peculiar attributes, including knowledge, perception, and memory." *Id.* One of the few exceptions is *Fredericks v. Castora*, in which the court held a professional truck driver to the standard of an ordinary driver when he caused an accident driving the family sedan. Fredericks v. Castora, 360 A.2d 696 (Pa. 1976). In *Johnston v. United States*, 568 F. Supp. 351, 354 (D. Kan. 1983), a federal court noted that a government contractor cannot hide behind the so-called "contract specification defense"—which protects a contractor from products liability if the contractor follows design specifications—"where the manufacturer has special knowledge or expertise." *Id.* In *Cervelli v. Graves*, 661 P.2d 1032, 1037 (Wyo. 1983), the court rejected the reasonable person standard in a case involving an accident caused by a professional truck driver, opting instead for an instruction that would permit the jury to consider evidence that the driver "was more skillful than others as a result of his experience as a driver." *Id.* In *Dillenbeck*, a police officer who killed a motorist in the course of a high-speed chase was held to the standard of one who possessed superior knowledge and skill by virtue of his "extensive training and experience." Dillenbeck, 446 P.2d at 136.

What is interesting about tort law in this respect, however, is that a good argument can be made that we should *not* alter the standard of care for an enhanced individual when it comes to avoiding accidents. Instead, we should hold them merely to the standard of a reasonable, unadvantaged person. The reason is that, by doing so, we encourage people to improve their vision, which in itself will avoid accidents, whereas if we made people with better vision liable under a higher standard, we would discourage them from enhancing their vision, thereby losing the benefit in terms of accident avoidance. Whether we imposed a higher or normal standard would depend on whether we thought that the benefits from reduced accidents on account of having drivers with better vision outweighed the costs of accidents caused by these drivers when they did not act like someone with improved vision.

A similar analysis might be made of rules that permit a party to a contract to benefit from superior information so long as the result was not too unfair. In this case, the argument would be that, by permitting the party with superior information to capitalize on that information, we give an incentive to create and obtain that information. The societal gain in information, it is reasoned, outweighs the unfairness to the inferior party to the transaction. *See* Anthony T. Kronman, *Mistake, Disclosure, Information, and the Law of Contracts*, 7 J. LEGAL STUD. 1, 19 n.49 (1978) (viewing fiduciary relationships "from an economic point of view . . . as a deliberate form of risk sharing . . . and fraud as economically undesirable" because it is inefficiently based on misinformation).

enhanced and unenhanced individuals. This frustrates our efforts to prohibit the use of performance-enhancing drugs in sports. The earlier discussion of licensing catalogued the difficulties in detecting enhancement and the potential solutions. It must be stressed that this is a critical issue. In all likelihood, technical solutions will be found, only to be superceded by technical innovations, leading to new technical solutions.

One partial solution to the detection problem might be to permit unenhanced individuals to assert a rebuttable presumption against persons with whom they interacted or competed with that they believe are enhanced. Unless persons against whom the presumption was asserted could establish that they were not enhanced, the rules would proceed to level the playing field (by having courts undo the deal; penalizing the person presumed to be enhanced for participating in a prohibited competition, and so forth). Failure to produce evidence suggesting that the person was not enhanced would satisfy the other party's burden of proof.[198]

Third, it will be difficult to distinguish between enhancement and effort. Society should arguably focus its leveling efforts on advantages derived from genetic enhancement, rather than on advantages obtained through personal effort. Otherwise, the effect will be to discourage effort, leading to sloth and loss of social benefit. It may be difficult, however, if not impossible, to distinguish between achievements that are earned and achievements that result from enhancement. Accordingly, some may argue that the rules ought to ignore whether or not someone was genetic enhanced.

Regardless of the difficulty of distinguishing between enhancement and effort, genetic enhancement may be so serious a social threat that it is appropriate to level playing fields. Indeed, society deprives people of plainly earned advantages in order to promote equality or fairness. Though not without its critics, progressive income taxation transfers earned wealth in part to achieve a more just distribution of resources. Weight categories in sports are enforced regardless of whether an athlete's size is the product of diet and exercise or steroids. Fiduciary law requires individuals with superior information to disclose it to beneficiaries, clients, and patients, even though it may have taken great effort to obtain the information.[199] Simi-

198. Presumptions of this sort are familiar in the law of leveling. In fiduciary relationships, when the beneficiaries of a trust challenge a transaction between them and the trustee, the burden shifts to the trustee to prove that the transaction was in the beneficiaries' best interests. *See* Deborah A. DeMott, *Beyond Metaphor: An Analysis of Fiduciary Obligation*, 1988 DUKE L.J. 879, 900 ("[T]he presence of a fiduciary obligation significantly affects the conduct of litigation by affecting the allocation of burdens of proof. If a suit challenges a transaction between a fiduciary and a beneficiary, the fiduciary has the burden of proving that it dealt candidly and fairly with the beneficiary.").

199. *Cf.* Salis v. United States, 522 F. Supp. 989, 997 n.10 (M.D. Pa. 1981) (noting that fiduciary law imposes duty to disclose information required to obtain a patient's informed

larly, an enhanced person might be required to disgorge her advantage (of information, market power, and the like), even though she obtained some or all of it through her own efforts. Alternatively, the fact that someone was enhanced could establish a rebuttable presumption that any advantage related to the enhancement was due to the enhancement rather than to effort.

Fourth, there are non-enhancement advantages. Just because someone is not genetically enhanced does not mean that they lack sufficient resources or talents to compete fairly with someone who is enhanced. The unenhanced person may possess great wealth, have some special store of knowledge, or have access to the best advisors. Therefore, leveling the genetic playing field may exacerbate unfairness if it focuses on genetic enhancements to the exclusion of these other types of advantages. If society attempted to correct for all differences between people, there would be no end to societal interference.[200]

On the other hand, the advantages conferred by genetic enhancement could be so great that it would be appropriate to single them out for remediation. Moreover, where enhancement merely created a rebuttable presumption of unfairness, the enhanced individual would be free to prove that her enhancement advantages were equaled or outweighed by non-enhancement advantages possessed by the complaining party.[201]

Fifth, denying a person of the advantages of genetic enhancement would require a high level of intrusiveness into his or her life. Given the difficulties of detection and differentiation described above, any attempt to level the playing field would invite public intrusion into highly personal affairs. To rebut an inference of enhancement, for example, a person would have to reveal his or her personal and medical history, including particularly sensitive information relating to genetic makeup and reproductive activities.

If the stakes are high enough, however, we seem willing to require

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consent because of the physician's "superior knowledge").

200. Nozick, for example, defends his lack of concern over inequality by arguing that people are good at different things. *See* NOZICK, *supra* note 78, at 243-46 (articulating this theory).

201. For example, a physician who is a patient of another physician's is owed the same duty of informed consent as a lay patient. *See* Canterbury v. Spence, 464 F.2d 772, 780 n.14 (D.C. Cir. 1972) (stating that even if the patient were a member of the medical profession, because of different degrees of medical knowledge between persons such as a specialist and a general practitioner, "it is only in the unusual case that a court could safely assume that the patient's insights were on a parity with those of the treating physician"). In the unlikely event that the physician-patient claimed lack of informed consent, the defendant would be permitted to show that the plaintiff's own knowledge and experience compensated for the lack of disclosure.

people to compromise their privacy rights. For example, athletes must submit to physical examination and to yield samples of bodily fluids for testing, often under nearly public conditions.[202] Given sufficient concern for maintaining privacy and the confidentiality of sensitive personal information, and so long as the least intrusive means were employed to decide if someone was enhanced, the cost might be justifiable.

Finally, potentially steep transaction costs are a significant drawback. Leveling the genetic playing field will be costly. Forums, advocates, and referees would be required to resolve fairness disputes; black markets, both domestic and foreign, would require policing; and the specter of a "war on genes" is not an attractive one. Yet again, the threats posed by genetic enhancement might well be worth the cost of leveling.

In short, there seems to be no reason why we should ignore the unfairness created by wealth-based genetic enhancement. This principle, however, could be circumvented in situations where the balance of social to personal benefit clearly demonstrated a substantial net benefit to society, or in situations in which the costs of leveling were deemed to be greater than the costs of unfairness. In all other cases, one or more of the leveling techniques listed earlier would be appropriate.

VI. LEVELING THE GENETIC PLAYING FIELD

Although our overall objective would be to minimize the unfairness in interactions between enhanced and unenhanced individuals, at the same time we want to maximize the societal benefit from individual enhancements. This raises the question of how to respond when the two objectives are incompatible, i.e., when individual unfairness can be prevented only by sacrificing societal benefit.

The answer depends on the nature and magnitude of the unfairness and of the foregone societal benefit. Ultimately, public policy should favor preventing unfairness if the cost of unfairness is deemed to exceed the expected societal benefit. Conversely, a substantial amount of societal benefit should be sought at the expense of a relatively small amount of individual unfairness. The more substantial the unfairness, and the more equal the costs of unfairness and societal benefits tend to be, the more emphasis should be given to correcting the unfair transaction.

Suppose we are reviewing applicants for scarce medical research funding. Successful research is expected to yield significant societal benefits. Applications are submitted by both unenhanced individuals and indi-

202. *See* Kathleen Taylor, *Intrusive, Degrading Procedure: Why We Oppose Random Urine Tests for Drugs*, SEATTLE TIMES, Aug. 4, 1986, at A9 (arguing against this procedure because of the high degree of privacy invasion).

viduals enhanced in ways that significantly increase their chances of research success. All other things being equal, we ought to award funding to the enhanced individuals. If the impact on the unenhanced individuals' careers is deemed significant enough, however, consideration might be given to mitigating the unfairness. Perhaps society could allocate a certain amount of funding for the unenhanced (a sort of "unenhanced persons' affirmative action program"), or favor applications involving both enhanced and unenhanced investigators.

There are a number of techniques that we may employ to mitigate genetic unfairness. Some of these techniques are more costly than others, both in terms of implementation costs and foregone social benefit. The enhanced individual might be required to share with the unadvantaged person the enhancement surplus. At a minimum, enhanced individuals would have to disclose that they were enhanced. In a business transaction, enhanced individuals who, by virtue of their enhancement, obtained superior information could be required to disclose that information to unenhanced persons in order to become licensed. Where a transaction is expected to yield societal benefit, sharing might be the preferred mitigation technique because it encourages the enhanced party—who will retain at least some personal benefit—to engage in the transaction. If sharing is impractical, like in zero-sum situations, or if the implementation costs of sharing are too great compared with the expected societal gain, unfairness might be mitigated instead by handicapping the enhanced party. For instance in contests, including athletic competitions, the enhanced individual could be put at a disadvantage, such as being given a longer distance or a harder question.

Another technique worth considering is allowing the interaction to take place but permitting the unadvantaged party to apply to a court or an administrative agency to challenge and overturn or adjust a result if it is too unfair. This flexible, post-hoc approach might be appropriate where the unfairness costs and societal benefits of a transaction were difficult to predict in advance. Making outcomes voidable reduces transactions costs by allowing us to review only those results that seem too unfair.

An interesting option is to eliminate the arm's length nature of transactions between enhanced and unenhanced individuals. Like fiduciaries, the enhanced would be made responsible for the welfare of the unenhanced, a sort of genetic noblesse oblige. As in true fiduciary relationships, this could decrease the costs of monitoring the behavior of the enhanced by substituting a system of sanctioned trust for a regime of direct external controls.[203] Additionally, it would create social benefit by encouraging the

203. *See* Maxwell J. Mehlman, *The Patient-Physician Relationship in an Era of Scarce Resources:*

unenhanced to interact—for their benefit—with the enhanced.[204]

Finally, society could prohibit non-beneficial interactions. An alternative to handicapping enhanced athletes, for example, would be to forbid them from competing against athletes who were unenhanced. This competition might be allowed only if the costs of enforcing the prohibition were great compared to the unfairness.

VII. CONCLUSION

The reader may be struck, as I am, by how different society would look if it adopted the suggestions I have made. Individual liberty and reproductive decision-making would be circumscribed in ways that presently seem unthinkable. A licensing system would control large blocks of human behavior. A massive "War on Genes" would target the domestic enhancement black market, and considerable foreign policy energies would be devoted to regulating the international gene trade. Much of an individual's hope for upward social mobility would be contingent on the outcome of a national genetic lottery. Finally, genetic privacy would be compromised by an enormous DNA data program, involving collection of DNA at birth, mandatory comparisons with parental DNA to detect illegal germ line enhancement, and periodic sampling later in life to identify individuals who were enhanced, but lacked an enhancement license, or who were employing their enhancements unfairly.

The reader may object that the threats to democracy are too speculative, and the perceived importance of equality and fairness too small, to sustain these major infringements on liberty and privacy. In particular, the reader may balk at the image invoked by the film "GATTACA,"[205] in which genetic monitoring is constant and ubiquitous. But there are likely to be a number of important reasons for maintaining a system of universal genetic profiling irrespective of promoting egalitarian objectives. First, health care

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Is There a Duty to Treat?, 25 CONN. L. REV. 349, 368-71 (1993) (illustrating support for this plan); Susan P. Shapiro, *The Social Control of Interpersonal Trust*, 93 AM. J. SOC. 623 (1987) (supporting this argument).

204. As I discussed elsewhere, making a relationship fiduciary only tells us in general terms what behaviors are expected. *See* Mehlman, *supra* note 203, at 349 (detailing the behaviors expected from a fiduciary relationship); *see also* Maxwell J. Mehlman, *Fiduciary Contracting: Limitations on Bargaining Between Patients and Health Care Providers*, 51 U. PITT. L. REV. 365 (1990) (making the same argument). In some cases, it requires no more than disclosure of the advantage enjoyed by the fiduciary. In other cases, the fiduciary is prohibited from taking certain actions to the detriment or relative detriment of the beneficiary. The design of fiduciary rules to govern interactions between genetically enhanced and unenhanced persons will require careful consideration and most likely will follow a period of case-by-case determinations by courts and administrators.

205. GATTACA (Columbia Pictures 1997).

providers will increasingly need access to genetic information about their patients as medical treatments become tailored to a patient's individual genetic make-up in order to increase efficacy and decrease unwanted side effects.[206] Second, access to personal genetic information will be important in any system of universal health insurance, such as President Clinton's proposal, that relies at least in part on private insurance. Insurers in such a system have an incentive to "cherry-pick"—that is, to sell policies only to healthier individuals who can be insured at a lower cost. The only way to prevent this is to pay insurers more when they insure costlier individuals, an approach called "risk adjustment." But to accurately predict how expensive it will be to insure someone and adjust payments to insurers accordingly, the health insurance system needs to know who is at risk for inherited disorders. This requires access to individual genetic profiles. Finally, DNA profiles are likely to be used by law enforcement for forensic identification, and by commercial enterprises for security purposes. And one further comment on the society portrayed in GATTACA. There, genetic profiling was employed by the class of enhanced individuals to maintain their privileged position. I envision the use of genetic profiling for exactly the opposite purpose: to promote equality and fairness.

Still, there is no question that all this seems odd and unsettling. But the alternatives are far more chilling. Imagine a society with a struggling genetic underclass locked into subservience by a ruling, self-perpetuating, genetic aristocracy, or a prolonged period in which the promise of genetic advances is lost amid mounting social chaos. One thing is certain, we are about to find ourselves engulfed in an unprecedented revolution in science and social policy.

206. A new field called "pharmacogenetics" has arisen to pursue this objective.